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I (Name and address of applicant, and, in case of a body corporate, place of incorporation)

אטלנטיום בע"מ
קרית התקשורת, סוויטה 338
נווה אילן
ד.נ. הרי יהודה 90850

Atlantium Ltd.
Suite 338, Communication Town
Neve Ilan
M.P. Harey Yehuda
ISRAEL

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(באנגלית) (English)
Method for hydro-optronic photochemical treatment and jet devices for use thereof

הממציא: זמיר טריבלסקי
Inventor: Zamir TRIBELSKI

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ד"ר מאיר נועם
עורך-דין ועורך פטנטים
ת.ד. 34335 ירושלים 91342
טל. 02-6518880 פקס'. 02-6523336

חתימת המבקש
Signature of Applicant

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This of 200

Dr. MEIR NOAM
ADVOCATE & PATENT ATTORNEY
P.O.B. 34335, Jerusalem
TEL. (972) 2-6518880

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שיטה לטיפול פוטוכימי הידרו-אופטרוני והתקני קילוח לשימוש בה

Method for hydro-optronic photochemical treatment and jet devices for use thereof

Inventor:

Zamir Tribelsky

Field of the invention

The present invention relates to method and devices using unpiped jet stream of light transmitting liquids, as a useful wave guide for various photochemical treatments, for example aseptic filling of liquids into containers.

Introduction to the Invention:

The present invention discloses a novel methodology for combining water with light for the purpose of guiding the light therein and throughout thus creating a flowing liquid light guide. Guiding light inside water for the purpose of decorative functional fountains and illuminated falls, such that can be found in ancient, and/or modern architecture, and interior/exterior designs, and in entertainment is well known. The present invention disclosed a novel inventive step wherein pulsed sub-microsecond laser light beams in the UVA, UVB, UVC, X-Ray, and visible regions of the electro-magnetic spectrum is locked, reflected, and utilized according to the methodology of the present invention, and wherein said pulse duration, width, or time is sub-microseconds adhering to the conditions for 2nd order interactions between light and matter performing multi photon absorption processes, amplification, and spatially controlling the TIR (Total Internal Reflection patterns) of the delivered light therein (within the jet stream). This is especially beneficial for treatment of liquids and surfaces as light is locked reflecting in the jet stream and thus can provide a multi functional feature enabling washing, filling, sterilizing any conduit or chamber simultaneously. More specifically the method of the present invention discloses novel methodology for aseptically filling bottles in the bottling industries, or for aseptically filling and simultaneously washing and disinfecting the inner walls or surfaces of bottles, conduits or chambers. More specifically an array of UV jet (hereinafter referred to also as "UVJET") units, may be used for aseptic filling a plurality of bottles simultaneously, driven by a solid-state optical fiber harness for delivering adequate energy dose for each jet in arrays of jets or for single remote clean room or production halls requiring 100% electrical safety or high level of biocompatibility. Especially beneficial for disinfection and aseptic filling of bottled water, mineral water, flavored water and beverage and agro-food industries. Further more, the method of the present invention is especially beneficial for bio-photonic and biomedical applications wherein light can be delivered externally or internally (in vitro or in vivo) within the flowing jet stream of UPW (Ultra Pure Water with reduced TOCs, VOCs) class water jet or any water based suspension. This facilitate the ability to remove catalytically (photo-catalytically or via photochemical process) tumors and excess or unwanted pluck formation (within main Aorta) or remove smoothly restenosis, tissues or sterilize area or dimension or liquid such as blood or water, or gas such as air or oxygen or combinations as well as disinfect surface such as human skin or tissue, polymers. The methodology of the present invention is also beneficial for washing and disinfection and advanced oxidation of human skin from BW, CW eventualities, or for the

protection and cleaning of metropo0litan areas from biological and chemical contamination.

The production of UVJET, (or a water stream carrying pulsed UV light) or sprinkler, or jet or fall or vapor) according to the methodology of the present invention wherein pulsed UV laser light beams are locked guided in the flowing variable liquid geometry by total internal reflection TIR) thus forming UVJET, or VISIJET, or X-RAYJET. More specifically the water (N1) flying, projected / rejected in space, i.e. in air, or from air to surface have a refractive index of around 1.3 (N1), and wherein the air or gas surrounding the liquid jet (N2) have a lower refractive index of around 1.00 (N2), thus creating a refractive index profile within the JET stream (N1/N2), as a result, light transferring the jet at appropriate angular orientation, stays locked, reflecting in the jet stream itself,. The time domain differences of (a) hydraulic non uniformities, and (b) pulse width, PW or the duration in which a pulse of light transverse the jet stream facilitate many advantages in photo-induced chemistry according to the methodology of the present invention.

Creating internal reflection therein (i.e. sub-microsecond pulses reflecting in the jet stream) is especially beneficial for applications requiring surface, and/or dimension, volume, and wherein light for disinfection or detoxification, or purification of surfaces having complex curvature is performed efficiently. The UVJET concept is especially beneficial for guiding light therein (in the water, liquid or gas or combination) for wide variety of photo -induced chemistry. More specifically, such treatment may be initiated wherein the jet stream is dielectric, semi-conductive, or super conductive or any combination thereof which may maximize yields and efficiencies in photolytic, photo catalytic, or for advanced oxidation processes involving the formation of radical species (such as OH radicals for example) according to the methodology of the present invention. Further more, the methodology of the present invention facilitate the production of a beam containing high energy density zone, producing radical species, offering disinfection and washing in a single action radical may be produced by photolysis of Oxygen or by photo catalytic interactions formed as a result of adding semi-conductor metal oxides, or nano particles or suspension which creates electron pair holes when pulses of light having sufficient e/V are introduced reflecting within the UVJET stream. Further more, production of a UVJET wherein high peak power UVA, UVB, UVC pulsed sub-microsecond light is encapsulated within the flowing water stream (according to the methodology of the present invention), enable potent photochemical, photo catalysis, photolysis and photo – electro catalysis processes to be performed simultaneously or separately or sequentially or in combinations. More specifically using the UVJET hydro-optic reactor architecture both producers and end users benefit. More specifically, no reflective coating or hardware reactor type are needed, no optical elements are required for replacement reducing periodical maintenance and replacement associated with current technologies using heat or ionizing radiation. Further more, time domain interactions within the real time flowing liquid waveguide of the present invention may be harnessed and monitored spectroscopically (i.e. in a spatially flexible geometrical variant reactor)

architectures, all which are beneficial for Programmable computer controlled photochemistry and photo treatment within the real time flowing liquid pulsed light guide the UVJET, VISIJET, X-RAYJET according to the methodology of the present invention.

Agricultural, environmental protection, disinfection, and sterilization, water and medical and biomedical and health related fields and for producing hydro-optical elements for laser industry and markets (hydro-optical means simultaneously processing light and liquid flow dynamics to create unique optical and photochemical effects. Further more, the methodology of the present invention discloses a novel architecture wherein lasing may occur without the need for cooling as actual lasing occurs within the flowing liquid being the cooling element itself. More specifically, the method of the present invention discloses a novel water laser amplifier facilitating unique set of advantages in two main categories as follows:

The first category relates to the ability to surpass conventional thermal limitation in conventional light sources, for example, actual lasing interaction occurs within the liquid itself acting as cooling element thus no external or integrated cooling units are needed.

The second category relates to the ability to process and offer sterilization of liquids never before available with conventional thermal pasteurization technologies, especially beneficial for bottled water industries for filling and for sterilization or disinfection of drinks, beverages, and agro-food products such as flavored drinks. The present invention also facilitates biocompatibility and purity required for water and liquids used in the biomedical and pharmaceutical industries or for producing ultra pure water (UPW) for electronic and chip manufacturing industries. The method of the present invention also relates to detoxification and sterilization of surfaces from dangerous bacteria and chemicals contaminating the surface either through normal application or by hostile action (when used not for aseptic filling but for NBC decontamination applications (not shown).The principle is combination of UV/VIS light with photo catalytic Materials in the context of a real time flowing liquid waveguide of the present invention. The chemicals (oxidants, photo catalysts) will be sprayed/scattered

(etc) in the form of liquid solution or suspension stream or droplets or cloud (etc) from one or more containers, with the light pulses synchronized so that illumination reaches the active chemicals in the right place (at or near the surface) at the right time. Pretreatment of surfaces with non-volatile materials such as TiO2, ZnO etc is another mode of application of the various components of the invention.

A UVJET according to the methodology of the present invention is having unique variable parameters creating new, and exciting spatial optical processing especially beneficial for manipulating light beams having high average powers, and high peak powers or qusi combinations. Such beams as those generated by today's modern lasers may be adequate to form 2nd order interactions such as those created by multi-photon absorption processes. Such powerful or accurate lasers and light sources (lasers, and hybrid light sources including

lamps, and lasers, or plurality of lasers) often requiring expensive optics, and optical grade manufacturing methodologies using HGFS (High Grade Fused Silica), SHGFS (Synthetic Fused Silica, and expensive semi-conductor coatings, often applying several layers of AR/RC (Anti-Reflecting/Reflecting type coatings). Devices using such lasers and light sources are subject to physical limitations, photo damage and deterioration affecting all optical components in the beam path and thus often cannot reach the desired performance parameters, damage threshold, and physical properties associated with truly industrial, continuous, repeatable operation. These limitations have dictated to designers, producers and end users to integrate expensive cooling units negatively effecting energy consumption, wall plug efficiencies, increasing periodical maintenance and replacements, while increasing capital cost associated with devices using currently limited methodologies, such that are effected by thermal dynamics and, optical damage thresholds. The methodology of the present invention surpassed current strict limitations by creating a flowing liquid waveguide in real time creatively assimilating hydraulic, pneumatic, electro-optic and photochemical effects simultaneously for purpose of sterilization, photo catalysis, photolysis, especially beneficial for environmental protection applications which does not necessarily required the stability and temperature stabilization and optical grade element effecting capital cost of laser engines and reducing the number of component in the beam path. The elimination of conventional optical elements substantially reduce the cost and periodical maintenance and replacements associated with conventional treatment technologies such as heat based sterilization, ionizing radiation and conventional electromagnetic radiation such as eradiation coming from lamps (mercury vapor lamps). Lamps are not generally good candidates for driving the UVJET of the present invention. The principle means for the generation of ultra violet light from lamps is using mercury vapor lamps. These lamps are self limited as they have radial emission, polychromatic wavelength and sport mostly continuous wave type of light. More specifically, conventional UV lamps require reflecting coating for the deep UV which is not available yet. More specifically due to the radial emission of these lamps it is impossible to harness their light efficiently and couple it to the UVJET, unless the light from the lamps is coupled to the jet stream externally or across its cross sections to increase photon flow, fluence rate. In line with the physical limitation of conventional UV lamps wherein the more pressure the lamp carry – the more energy can be produced, but not in he UV part of the spectrum (lamps carrying high pressure output more infra red IR and visible then UV). As pressure is reduced the lamp produces much more UV, but withy no power thus conventional UV lamps are not adequately positioned to operate the UVJET of the present invention classically, however hybrid combination involving sub-microsecond pulsed UV lasers and lamps are indeed beneficial for increasing photon fluence rates and increasing the background light in the jet stream through which pulsed UV laser light is being reflected simultaneously or sequentially or singularly or in combination.

As the limitations imposed by thermal co-eficiencies, and damage threshold prohibit progress in these beneficial research fields such as (a) conventional quantum laser developments, (b)

FELs developments, and (c) solid state, diode pumped lasers. In view of current technological evolution taking place, thus involving several key industries the search for economical, industrial optical processing techniques, materials, and production methodologies is ever imminent, and important. The methodology of the present invention provide a unique, and creative spatial optical manipulation, guiding, and projecting using a flowing liquid waveguide having a higher refractive index then the space surrounding them thus while in motion guide light therein (i.e. in the jet, stream, fall, flows or combination) for purpose of sterilization or lasing, photo catalysis or photolysis or combination for achieving the photochemical effect desired.

Currently used production methodologies for high grade optical elements, are mainly using high energy driven temperature generators, heavy machinery, heaters driven mold processes, furnaces, often pause safety threats, and expensive surface processing, and coating treatments for polishing the finished element or lenses.

Current commercial efforts aimed at manufacturing such high damage threshold UVC optics, have failed to provide industrially acceptable high quality, high damage threshold, optical grade UVC optics and repeatable optronic processing free of thermal conventional limitation of optical grade materials.

Current evolution in laser, electro optics, electronics, and solid state electronics have pushed energies higher, and increase substantially time domain optronic manipulation capabilities (i.e. creating more peak power densities), and increase demand for wide variety of coupling, switching methodologies. Currently used optical grade production techniques rely on high temperature, skilled engineering, and considerable infrastructure, and energy demanding production sites limiting the scope and commercial and industrial high power laser applications, laser induced photochemistry, and material processing applications requiring lasers operating at high average, high peak powers, often at very high repetition rates.

More specifically, by creating a refractive index profile wherein the flowing liquid refractive index is higher then the refractive index of the air (or gas, or combination) (or gas) surrounding it light is guided within the flowing jet stream. Further more the present invention facilitate the formation of high efficiencies in coupling light to surfaces having complex curvatures, and to the simultaneous motion, process co-efficiencies, and beneficiary advantages of washing, and disinfecting in a single action. Such efficient t cleaning action and sterilization may be applied to wide varieties of surfaces, substrate materials, including the ability to reach, and cover (i.e. disinfect, sterilize, purify, trigger) complex surface curvatures. Such surface curvatures that can be found in medical tools, instrumentations, and wide variety of accessories from many industries including packaged water products such as bottles and jugs (bottles & 5 gallons jugs for example).

Refractive index value of water generally stands on 1.33 and wide variety of liquids exhibits

refractive index which is higher then the refractive index of the air surrounding it (i.e. surrounding the jet stream wherein the light is reflected), thus light projected, or delivered accurately, according to the methodology of the present invention will be guided through the flowing liquid jet, or distributed to the jet using optical fibers or other solid state optical waveguides or fibers (such as high grade fused silica or synthetic fused silica , HGFS, SFS, or photonic band gap crystals) or combinations. Light may also be diffused prior to entering the jet-stream, within the jet stream or after passing or transferring the jet stream by total internal reflections. For certain application using the UVJET according to the methodology of the present invention treatment may be applied using the edge, or distal remote tip of the jet stream, for other applications, the UVJET stream itself is a virtual reactor architecture wherein photochemical, photolytic, or photo catalytic processes and combination interactions are occurring being performed using the methodology of the present invention.

When the liquid is flowing, light coupled to the flowing waveguide is locked, reflecting by internal reflections (TIR). More specifically, The present invention also disclosed a novel methodology for treating surfaces with changing, and/or variable curvature parameters due to the novelty of locking beams of pulsed laser light in jets, falls, and water in motion thus forming geometries (hydraulic, pneumatic, electronic, and, electro optical, and photochemical interactions, and combinations) of water. Further More, the inventive creative progress embedded in the textual disclosure according to the present invention describe a novel interaction which further enhances time domain interactions allowing controllable maneuverability from 1st, 2nd, 3rd order optronic, electro-optic, and photochemical and photo biological interactions. " A method for the production of catalytic liquids, and gasses jet forming plasma driven flowing liquid light guide, and all electro-hydro-photo catalytic devices for use thereof", especially beneficial for the production, coupling, distributing, and applying dose of a predetermined energy levels, within a predetermined space, over a predetermined time, but with the vital inclusion of a refractive index profile which encapsulate the light beams as they propagate throughout the path length of the flowing liquid/s, further more, the variable dimension of the specific liquid in motion (i.e. water/air) forming a refractive index therein for keeping, reflecting, and locking the UVB,UVC pulsed laser energy maximizing its photochemical applications for the benefit and the protection of public health is herewith disclosed.

More specifically, as an example; the present invention may include photo catalytically initiating protection for inner space of the mouth, or for the removal of pluck formation from teeth or inner cavities sterilization and washing and cleaning simultaneously. More specifically by forming a catalytic light barrier technology such that creates a "fire wall", or in simple words a hydro-optical drilling and sterilization effects may be produced using the UVJET of the present invention. Such cleaning lightjet for specific dental or periodontal procedures is most beneficial for medical and biomedical industries as it provide 100% electrical safety and extremely high levels of biocompatibility. More specifically, the present invention facilitate the

formation of a flowing liquid (water) light guide (using deep UV) for specific photo catalysis interactions, or for photo induced chemistry, or for removing, and dissolving pluck in arteries or tooth, or residues, and for generally applying water and light combined for physio-optical interactions, and for photo-induced chemistry in vivo and in vitro.

Utilizing the methodology of the present invention may lead for the development of devices according to the present invention wherein no known noxious species may penetrate and replicate, (i.e. bacteria, viruses) and thus have no ability to infect (present invention causing inactivation of their DNA, and RNA replication sequences). Especially Beneficial for the removal of pluck formation in periodontal treatment, and in arteries (see pluck formation in arteries Fig.1,2,3,4,5), and in keeping maintaining, and repeating triggering photo catalytically, photolytic, or by centilating processes causing appropriate triggering of H2O2, or TiO2, or TiO2/ITO or combination of photo-catalytic semi conductor coatings, or substrates, or surface encapsulation, thus once initiated oxidize predetermined noxious species which may inhibit the surfaces curvature, and the deeper layers, and volume surrounding the mouth area, body parts, inlets, or outlets, conduits, and chambers, or surfaces and volumes, more specifically the present invention disclosed a novel methodology wherein such catalytic, and/or photo catalytic interactions may be triggered by a UVJET, or a flowing liquid waveguide able to deliver the right level of dissolved oxygen, stabilize PH, and offer powerful delivery medium for photo catalysis interactions (i.e. such as may be selected according to application requirements, H2O2, TiO2).

More specifically, wherein cuts and sores to body external surface, may cause damage to external body parts/tissues, and thus open the potential for infectious

events entering the body, such events introduce potential threat of contamination, and cross contamination through use, and thus the methodology according to the present invention offer the realization and harnessing of advance catalytic oxidation technology facilitating uncontestable technological advantages due to the fact that the boundaries of the flowing liquid light guide are reflecting deep UVB, UVC, UVA pulsed laser light thus allowing a specific photon of light to transverse more efficiently to a given geometry, molecule or target organism. Use of the UVJET enhances the probability for 2nd order interaction (i.e. multi photon absorption processes), these non linear effects greatly accelerate the rate of photochemical processes in aqua suspensions, water, or any liquid or gas or combination and surpass limitation of conventional 1st order interaction driven treatment processes currently available using a continuous wave UVA, UVB, UVC (CW) often with polychromatic spectral characteristics, normally offered by CW UV lamps.

The methodology of the present invention disclosed the ability to couple light from sub-micro second pulsed UV lasers operating at high average powers, and high peak powers, often at high repetition rates, thus the novel methodology of the present invention does not require optical windows, lenses, and additional optical elements normally associated with spatial

optical processing in the UV range, at such high powers (sub-microseconds, yielding high peak powers, ns, ps, Fs, as pulse width PW or time domain).

More specifically by preparing in advance all relevant parameters for efficient oxidation processes to occur (i.e. such as Oxygen, PH levels, stabilization, and the photo catalysts) in a tight cohesive, and homogenic and/or multi-component system or suspension, the present invention simplify, and guaranties photo catalysis processes in the presence of triggering energy density thresholds. The present invention discloses competitive advantages when geometrically utilizing thoroughly space, and time, and light causing sterilization by pulsed ultraviolet (time domain driven) laser light for disinfection of wide variety of medical instrumentation and engineering tools by having the ability to guide light through a flowing liquid waveguide having a higher refractive index therein (i.e. in the jet stream, fall, or flow or combinations) then the refractive index of the surrounding space (i.e. air). Such refractive profile thus created (water at 1.33, and air at 1.00 causes light to be guided using total internal reflections (TIR).

Several technologies exist for the provision of surface treatment applications; These currently used technologies introduce strict safety, reliability, and credibility and efficiency limitations due to their chemical, residual, often toxic, expensive, slow, labor and material driven procedures and processes. Further more, current methodologies for surface treatment of instrumentation is cumbersome, and could not easily be adapted to cover applications requiring actual treatment of physiological damage to tissues, and/or for cuts, sores, wounds, to living human beings. Further more, in the field, or as in during critical medical procedures under time constraints, wherein often there isn't sufficient time available to wait for certain chemical action to proceed (such as when using biocides, or chemical disinfectants), or for instrumentation to be returned from central, often far autoclaving, and disinfection equipment centre (i.e. such as in hospitals, and medical centers, or clinics), failed to provide adequate safety measures for vital tools, and instrumentation, often results in making their associated working cycles longer, less efficient, requiring substantial replacement hardware components, and leads to unnecessary manual procedures, and subsequent expenses in human resources, and high energy consumption (high capital, and operation costs) as well as potential failure of vital medical procedures. The methodology according to the present invention is not so limited, that's why the present invention could be utilized for wide variety of application including but not limited to (a) Ultra sound procedures (b) medical surgical procedures, (c) Dental treatment procedures, (d) Cosmetic procedures, (e) Gynecological procedures, (f) 1st aid treatment applications, (g) Bulk sterilization of tools and medical instruments, (h) Medical preparation, (I) Transplant procedures, (j) Diagnostic procedures, (k) By-pass operations, (l) Skin, and dermatological treatment procedures, (m) Chemical production sites for drugs, and medicine (n) Rehabilitation centers, (o) Hospitals, (p) Clinics, (q) Operation procedures in cancer treatment, (r) Medical procedures for birth, and pregnancy diagnostics, and treatment, (s) Treatment of burns, (t) Treatment of cuts, bruises, wounds, (w)

Treatment of areas exposed to radiation, (x) Treatment of packaging of medical preparation, and drugs production or analysis, (y) Treatment of surgical instrumentation, (z) Treatment of diabetes wounds, treatment of liters, and gallons conduits or chamber containers, and bottles of mineral waters, flavored water, return lines of mineral water containers, beverage conduits, and chambers, washing of ships, transport vehicles, disinfection of devices and tools for the medical fields, instrumentation, and for photo induced chemistry. The UVJET according to the methodology of the present invention is also beneficial for dissolving pluck formation in the main aorta, and for unblocking clogged restenosis and residual compounding volumes in stenting procedures or for enhancing artery cleaning procedures.

The present invention is also beneficial for cleaning applications such as Cleaning vehicles, Cleaning airplanes, cleaning ships, and busses, Lories, and semi-trailers, tankers on land, sea, and air. Further more, several applications illustrated herewith as having best mode for utilization of the methodology of the present invention wherein coupling of high rep rate, high peak powers, high average powers lasers into water is disclosed, eliminating the need to use expensive optical lenses, saving on periodical maintenance, and replacements of devices using the methodology of the present invention.

More specifically, such preferred applications clearly illustrate an important innovative solution wherein the size of the actual triggering light (or energy, and/or energy density under no circumstances dictate the size of the catalytic 'fire", or free radical species thus generated by the processes according to the present invention. The present invention disclose a novel methodology for hybrid disinfection of surfaces, to disinfection of volumes, to static storage sites, to large installations treating high flow rates or complexes surface curvatures (i.e. 2D/3D) such as appearing to shape modern medical instrumentations, and wide varieties of engineering tools. More specifically, by guiding light in the flowing liquid light guide the high energies which normally (when using conventional optical elements) generate heat, limiting the scope, and power capacities of currently used coupling methodologies, the present invention generate no heat due to the fact that the light is transferring actual cooling element i.e. the water or liquid used. In simple words the present invention facilitate the coupling of high power laser devices to liquids, and gasses eliminating the need to use conventional HGFS (High Grade Fused Silica, high purity glasses) quartz elements, instead it is possible according to the present invention to utilize water flowing. Given that the refractive index of water, and its transparency, when pure to the UVA, UVB, UVC bands of the electromagnetic spectrum further emphasis the novelty and inventive step of the present invention.

The present invention discloses a novel methodology for creating a real time flowing liquid wave guide or photochemistry, comprising the following steps; inserting or coupling output from at least one radiation unit having a high intensity pulsed sub-microsecond laser UV light beams into an input opening in a hollow aerobic, non toxic, water projection means being a conduit or a chamber having integral conductive, dielectric, semi conductive or super

conductive link having at least one inlet and an outlet launcher shaped for dynamic hydro-optical and photochemical predetermined processing effects and wherein said conduit or chamber having at least one opening un-hindered for passage of liquids and light simultaneously throughout and wherein each of said openings is equipped with optical input or output having predetermined diameter, acceptance angle and biocompatible or photo catalytically immobilized inner or outer surface area layer or thin film coating and at least one venturi suction point sufficiently large for light to be inserted through said opening passage, and sufficiently small for the liquid to remain inside flowing forward in a continuum of laminar or turbulent or combinations flow formats; Pumping simultaneously predetermined volume of liquids or gasses or combinations through said inlet of said water projection means to be processed or triggered by the interactions of said guided light; launching forward simultaneously at least one jet stream having a higher refractive index at about 1.3 or N1, then the air or gas surroundings having a lower refractive index of about 1.00 or N2, such that said jet streams form a refractive index profiles N1/N2 with its surrounding, adequate for guiding said pulses of light by total internal reflection; guiding or delivering projecting and simultaneously filling packaged liquids or sequentially spatially processing said pulses of light and liquid therein, and throughout or distributing said pulses and liquid directionally to a predetermined surface target site or to said liquid package having a refractive index lower or higher then the flowing liquid light waveguide or N3 or combination N1/N2/N3 and wherein said jet stream may contain at least one bubble; delivering a continuum of predetermined volume of said liquids, and gases simultaneously to said outlet launcher positioned further along said hollow water projection means, at a predetermined pressure volume, or flow rate or combination sufficient for the formation of at least one ventury pressure point at said non hindering opening eliminating the need to use solid state optical grade elements or lenses, reducing the number of elements in the optical path length from air through water to surface reducing attenuation, increasing damage threshold, reducing periodical maintenance and replacements; Adding or subtracting a predetermined oxygen concentration, or singlet oxygen species, or predetermined oxidizer, or photo-catalytic semi conductive metal, or metal oxide particles, or nano poruse, or non porous multi-components or semi conductive or dielectric combinations to the flowing liquid jet stream proportionately so as to form radical species or for photolytic, or photo catalytically triggering or for directly photo chemically effecting disinfecting, or sterilizing, dissociating, mineralizing or oxidizing, cleaning or decontaminating said liquid or gases or surfaces or combination in a single simultaneous action within a predetermined period of time.

Examples of the UVJET ability to deliver light without the thermal limitation quantum conventional laser suffer from (i.e. generation of heat, subsequent cooling systems currently in use and which increase dramatically the capital cost associated with conventional light sources), the methodology of the present invention may be used for the creation of water based lasers, amplifiers, and spatial processors using a flowing liquid waveguide according to the present invention, examples includes: /1 Air based catalytic compound oxygen charged

and triggered, b/1 Catalytic globulin mixture wherein its best mode of being triggered is by at least one pulse of light being generated by a high peak power, high repetition rate laser, c/1 A catalytic compound lighter, or heavier then air being triggered while in transition or drifting, and wherein its catalytic actions produces sufficient free radicals to efficiently dissolve toxic substances, traces, or any liquid or gas or combination containing noxious or poisonous nature, d/1 Steam type catalytic multi

Component compound having being produce on the ground or from a flying vehicle or plain, or propelled to/from different locations according to needs. indeed the goal of many scientist, biotechnologists, medical engineers, doctors, and surgeon requiring tools for dealing with infectious events is the ability to reduce working cycle, periodical maintenance, and replacements, and offer a more efficient treatment methodology thus able to remedy larger portions of the population in need, and to offer enhancement to currently available socio-economical performance. The method according to the present invention present competitive advantages, and important saving benefits especially for medical, biotechnological, hospitals, clinics, and agricultural, and industrial applications, thus enhancing the quality of life in the human sphere by having the ability to use the method of the present invention to create devices able to wash, and disinfect simultaneously. (Such that are illustrated by the UVJET, or flowing liquid waveguide, or spatial processors for the deep UVC from water).

Further more, the methodology of the present invention disclose a real time treatment methodology by pulse power triggering of photochemical, and/or photo-catalytically surface treatment processes, and further penetrative techniques (using surface treatment to trigger volume treatment). It is already known in theory that every material may oxidize or break down if energy is applied to it, having at least equivalent amount of energy as the one holding it's molecules and atoms together. The real world is very different - More specifically, due to already available vibration excitation stages available to help break the "bond", it is preferred to utilize ultrasound together with the flowing liquid wave guide, thus creating a high energy density zones, wherein the fluence rate, or the energy densities, or the dose, or the average energy, or the powers or repetition rates, are simultaneously trajected to generate OH* species, together with the ultrasound causing particle size reduction, thus enabling more efficient disinfection, and reduction of the UV absorbency levels of the medium being disinfected, or sterilized. The methodology of the present invention disclosed several techniques for performing light TIR (Total Internal Reflections, i.e. guiding light in the flowing stream of the liquid) the present invention offer the ability to keep operating equipment use in medical procedures safe at all times, and eliminate the need to replace expensive optical elements. The methodology of the present invention is also offering much quicker turn over, shorter working cycle, and the ability to ensure high level of biocompatibility, while turning noxious species on the surface of said medical instrumentation into more innocuous, more

Manageable forms in real time, especially beneficial for ultrasound procedures (examples include: in biomedical applications, or in monitoring pregnancies) using photo catalytic water based carbomer coupling gel, and for the protection of wide variety of medical instrumentation using the UVJET according to the present invention. More specifically, Equipment peripherals could be washed, and disinfected/sterilized using the method of the present invention. Most medical instrumentation is in need of sterilization, or disinfection leaving bacteria, and/or noxious species at a sufficiently low concentration according to standards, and health, and safety regulations. Further more, medical instrumentation used in wide variety of medical procedures is currently being treated with chemical disinfectants. As heat already being considered as one of the most expensive disinfectant, or sterilizing methodology often requiring long and wasteful work cycles schedule. More specifically, the long time cycle chemical disinfectant takes for effective inactivation of DNA & RNA replication sequences or for oxidizing thus inactivating noxious species fuels the drive for new more efficient, non chemical methodologies. Such is the method of the present invention; it is a non chemical, non residual treatment technology. The Present invention by using a photo catalytic compound made out of water, silicon, and photo catalytic material, such as TIO2, for example, the present invention disclose a novel methodology for treating wide variety of surfaces (of medical instrumentation) in short time facilitating the formation of workstations, and devices using the method of the present invention transferring pulsed laser light to a remote receptive interface, activating photo catalytic agent therein (in the coupling solution used). More specifically, the methodology of the present invention is using Ultraviolet light from about 200nm, to about 400nm to activate the photo catalytic agent present in the water based coupling gel (normally made out of silicon/water solution). By exposing the thin film coating left on probes, and ultrasound accessories, or body parts externally wounded, or for cuts, to a plurality of laser pulses in the region of the UVA, UVB, UVC, the present invention, triggers said thin film catalytically, and thus photo catalytically inducing beneficial photochemical processes (for example disinfection, and sterilization), thus purifying, disinfecting, and inactivating noxious species on the plurality of surface described above (i.e. such as the surface of the medical instrumentations, wounds, cuts, sores, or externally damaged body surfaces). Further more, according to the method of the present invention said laser pulses having germicidal wavelength, and sufficient e/V energy for the specific treatment require for a particular application wherein mild dissociation effects are beneficial for the methodology according to the present invention having

objective of providing an active source of hydroxyl radicals (i.e. OH* radical species) to offer photo catalytic solution in the field, or in disaster areas, or in places wherein the population is exposed to unexpected conditions dictating medical procedures to be performed without the infrastructure normally associated with hardware equipment for disinfection (I. Such as autoclave, ovens, Gamma rays, Radio waves, X-rays, microwaves, heat, cold, Sonication).

The present invention disclosed a novel methodology for forming a flowing real time liquid

wave guide for the delivery, and distribution, spatial processing and manipulation of pulsed UVA, UVB, UVC lasers operating at high powers for the purpose of disinfecting surfaces, volumes, spaces, and substrates, inner surfaces of containers, and wide variety of tools, instrumentations, and devices in medical, engineering, agricultural, and industrial washing, and disinfecting simultaneously action, boosted with ultra sound, to reduce particle size (reduction) further conditioning the liquid utilized for the real time liquid flowing light guide according to the methodology of the present invention. Photo reactive disinfection of surfaces and beneficial disinfection, and treatment of wide varieties of medical instrumentation is possible using the method of the present invention, and in addition it would be a preferred mode of operation to cover the surfaces of washed, or disinfected, sterilized or treated, exposed or combination using a thin-film coating, and activation on the surface of wounds, cuts, bruises, sores, damaged parts of external body surface), and in air, such as when infectious events may pause threat to humans, animals, and plants. Further more, by integrating into high purity water enriched with oxygen, and mixed with catalytic powder, or liquid, or gas, or light the methodology of the present invention facilitate the formation of active free radical layer swiftly making the surface curvature/proximities sterilized. Noxious species on the said surface are then inactivated, thus the surface is been made safe from infectious events, (bacteria, viruses, and other health threatening noxious species). The present invention is extremely beneficial for much medical application hence there are no need for actual physical touching, tiring, or swiveling of tissues, or there is no need for physically interfering with an already sensitive, and often critical medical treatment scenarios. The present invention facilitate the formation of a free sterilized zone extending to reach the entirety of the spread of said catalytic compound, naturally in line with environmental conditions such as wind, air compound, PH levels, dissolved Oxygen and other factors effecting photo catalysis quantum yield of efficiency (100-107), (a-z), (a/1-z/10). (Figures 1-30).

Disinfection, purification, and sterilization and photo-treatment by Ultra Violet light technology is well known, this technology is preferred due to its non residual, non chemical, and effective (wavelength range from about 220nm-357nm) inactivation of DNA & RNA replication sequences in wide variety of noxious species, (such as bacteria, viruses, Cysts, and Pathogens).

Currently used methodologies utilizing UV light for disinfection, and photo-treatment is making use of (CW) Continuous Wave, often polychromatic light sources, most of which having radial emission, and not sufficient peak power (i.e. such as generated by P.W. type light sources). More specifically, the principle means for the generation of Ultra Violet light for disinfection and for photo-treatment is by using Mercury type light sources, or lamps. These lamps generate continuous type of light (i.e. CW), and the majority of the light they generate (their peak emission) (mercury), is at the region of about 254nm. These light sources/lamps, thus does not have the required wavelength for offering efficient disinfection, and sterilization of

wide varieties of medical instrumentation. More specifically, current methodologies for disinfection and sterilization of medical instrumentation include heat, Gamma rays, X-rays, Y-rays, radio waves, Ultra Violet, microwaves, chemicals. These methodologies while offering currently implemented solutions, imposed strict limitations on

Field of the invention:

The field of the method of the present invention is environmental protection, and the protection of public health, and tools associated with domestic industrial, medical, engineering and environmental fields. By cou0ling light non invasively into the flowing jet stream of liquids, and gases using pulsed power optronic technology in the UVA/B/C electro-magnetic spectrum, and associated hydro optically resolved and aligned peripheries the methodology of the present invention disclosed a novel inventive step requiring no conventional optical elements. The driving principle behind the technology is synchronized control of the time domain, and facilitating an interactive variable platform for guiding light, and for spatially processing light therein (i.e. in the jet. When which appropriate dose of light is delivered into specified water forming flanged geometry, or predetermined surface area causing specific electro optical, and photochemical effects in said water, and the target contacted by the jet/beam extension the method of the present invention offer simultaneously washing, disinfecting, sterilization, and dissociation capabilities in a single simple, creative platform,

surpassing limitation imposed by the use of conventional I optical grade lenses, and elements, eliminating thermal limitation, maximizing time domain interaction in the liquids, and gasses thus delivered, flowing through, or utilized therein (in the jet stream or flowing water). More specifically, The present invention discloses a novel methodology for harnessing a multigradient refractive index profiles causing light in the relevant germicidal spectral regions to stay locked, guided, and reflected within the water of the get, stream, falls, sprinklers, or shower tub, or filtration system, especially beneficial for water treatment of drinking, wastewater, aquaculture, and water reclamation, water recycling, and water purification workstation driven applications and platforms. The novelty of the present invention could be further utilized for surface disinfection, and purification, and for dimensional coupling light from about 1 mJ, to about 1 mw/Cm2 regime to the TW/Cm2, average power, and to peak powers reaching up to hundreds of billions of watts in cross sectional energy densities, and such high intensities are coupled to water according to the methodology of the present invention harnessing the quality of life through implementation of total bio-security for water and air, and other liquids and gases thus, devices according tot he present invention facilitates efficient socio-economical treatment platforms for the protection of public health and the environment.

by facilitating the catalytic formation of radical species (such as OH*) barrier technology (CFRS, ref 3 a-z), a layer which upon triggering turns to "fire wall" (thus preventing passage through of noxious species due to the short duration of time [Fs] in which the catalytic

processes occurs) made out of multiple layers of highly radical species, lasting extremely short fraction of time, for the purpose of forming photo reactive layer wherein the preferred mode for advance Catalytic Oxidation, Electro catalytic Oxidation, photolysis, and photo dissociation (of upper surface layers of medical instrumentation, as well as actual damaged tissues of the Human body) occurs, the present invention by guiding light in a real time flowing liquid wave guide offers many advantages, remove thermal limitation, and provide an important socio-economical benefits helping protect mankind, and its environment.

More specifically, the present invention facilitate the provision of a protective photo reactive barrier technology (PPRBT), by means and utilization of light, liquid, gasses, and optronic time domain triggering (such as can be produced by high peak power high rep. rate UV lasers), increasing the probability for Multiphoton absorption processes to occurs help, and expand spatial

Characteristics and conversion procedures wherein a specific wavelength is desired, for specific application.

re by introducing additional (1) oxidant, oxidation agents, and reactive species, photo reactive scintillating, or fluorescence species so as, these in turn are non linear in nature , and cause dramatic increase in the efficiencies and co-efficiencies associated with effective photo treatment, and disinfection, sterilization and bio-security in wide variety of environmental, agricultural, medical, and commercial, domestic, and municipal treatment applications.

While disclosing a creative solution to couple high intensities into the spatial characteristics of the continuum jet water virtual reactor geometries, the method of the present invention offer a methodology for cases wherein external cuts may hinder physiological activity, and may lead for infection, or further complications. Further more, the present invention facilitate photo treatment of surfaces faster then any previous methodology in the field by using photo catalysis, electro catalysis, and hybridization techniques. The novel methodology of he present invention facilitates the protection of large areas from harmful effects of contact with bacteria, or from contact with noxious or poisonous species.

By calibrating the action spectrum (i.e. absorption, transmittance, transparency, refractive index, or refractive index profile of the air/body, air/instrument, liquid or gas encapsulating layer (i.e. the layer "barrier between the surface of the actual instrumentation or body surface, and entering/triggering beams of pulsed light, and the required coupling of light to the surface to be treated, thus taking into account specie specific wavelength interactions of the laser light (source used in accordance with the methodology of the present invention), the present invention offer economical solution using energy efficient methodology, and extremely safe operation procedures, requiring no skill operators, or special complex hardware procedures. The method of the present invention is simple to implement, and include fully automatic procedures management, so easy integration intro already made set up is simplified, and

conserve time and energy during integration, installation, and operation procedures.

More specifically, the method of the present invention by using for example, a pulsed, high repetition rate, high peak power laser light sources, facilitate the formation of high energy density zone through which liquids, or gasses carrying contamination, or may be penetrated by invading antigens, are thus treated according to the methodology of the present invention.

One best mode among the many utilizing the method of the present invention is especially beneficial for disinfection of wide variety of medical instrumentation.

Further more, the methodology disclosed by the present invention offer solution for medical procedures requiring short working cycles, and thus offer important benefits in terms of shorter duty cycles, faster processing time, safer inactivation/Dissociation effectiveness, and important capital savings due to the novelty of the methodology of the present invention for photo catalytic protection of medical instrumentation or surfaces, or dimensions, or volumes by using UVA, UVB, UVC light produces by high repetition rates, high peak power lasers, lamps and wide variety of hybrid integrations.

The method of the present invention also relates to detoxification and sterilization of surfaces from dangerous bacteria and chemicals contaminating the surface either through normal application or by hostile action (when used not for aseptic filling but for NBC decontamination applications (not shown).

The principle is combination of UV/VIS light with photo catalytic Materials in the context of a real time flowing liquid waveguide of the present invention.

The chemicals (oxidants, photo catalysts) will be sprayed/scattered

(Etc) in the form of liquid solution or suspension stream or droplets or cloud

(Etc) from one or more containers, with the light pulses synchronized so that illumination reaches the active chemicals in the right place (at or near the surface) at the right time. Pretreatment of surfaces with non-volatile materials such as TiO2, ZnO etc is another mode of application of the various components of the invention.

Background to the Invention:

Scientist, engineers, bio-technologists, and producers, and end users have been searching for years for optics, and optronic elements, lenses and optical beam management for the deep UV and other regions of the electro magnetic spectrum (UVA,UVB,UVC,VIS, NIR,IR) region of the electro-magnetic spectrum. Most conventional widely available optics are not able to whithstand the great energy and thermal dynamics associates with cooling high power light beam to water, air, or combination of liquids and gases. Most types of glasses have been

tried, and wide varieties of high grade fused silica are available to deliver deep UV light. However, these elements are expensive, and are limited to the energy levels that could be delivered. Further more, spatial limitations, and damage threshold limitation and have been imposing strict limitations as to the ability of quartz type, and synthetic glass elements to delivered the energy levels often required for commercial material processing, lithography, and photo induced chemistry. More specifically, strict limitations to produce a UV reflective coating, have hindered progress in this field, leaving many spatial processing only available from quartz 7and expensive optical grade polymers, and crystals, all of which are mainly used for processing and manipulating light beams in other regions of the spectrum, such as can be seen in the VIS,NIR, IR (i.e. such as in telecomm, & IT).

More specifically modern technology has failed to provide adequate coating techniques able to provide efficient reflection for commercial applications. Further more, most coating reflective efficiencies often not exceeding the 30% mark respectively when wavelength is below the 270nm. As progress in microelectronics, hydraulics, laser pumping architectures, cooling, pneumatics, and photochemistry yield more accurate diagnostic tools, and software based ray tracing and time analysis, the methodology according to the present invention disclosed a novel proven conceptual design criteria, not available before in any conventional reactor design's historical track record. The method of the present invention which surpass these limitations imposed by conventional technologies is making available to engineers, producers, scientists, and end users, managers and quality controllers a flowing light guide with plasma coupling centre facilitating efficient light coupling to variable changing refractive index profile driven virtual reactor geometry made out of water, or liquids and gases combinations. This unique coupling ensure optronic efficiencies not available in conventional lenses driven coupling optics (ref 1:A-Z) wherein high average power, high peak power, intensity driven UVA,UVB,UVC pulsed laser photo induced chemistry is efficiently generating free radical species, or oxidizing, or dissolving and/or dissociating and wherein the actual flowing liquid light guide is made of or complimented with or mixed with photo catalytic substances, and elements which once activated greatly increase the efficiencies associated with the photochemical task or application device interoperability and interconnectivity needed to achieve repeatable, standardized operation. Such operation is aimed at the protection of public health, and the environment.

The method of the present invention is especially beneficial for environmental protection applications such as: Sterilization of surfaces and volumes, tools, and interfaces, devices, and global system methodological architectures, disinfection, laser beam management, lithographic processing and optical spatial processing for the deep UV. Such applications may include the need for thermal management, and temperature gradient which may effect material selections, procedures, and design criteria's. The methodology of the present invention may be used to solve many industrialize, agricultural, domestic, medical, infrastructural, economical, and technological challenges given the fact that the cooling

element itself (the liquid, gas combination) is the medium in which the light propagates thus substantially increasing cooling efficiencies associated with the need to evacuate heat from a predetermined area, space, volume or boundaries of conventional optical elementals (such as used in conventional disinfection reactor geometries orientations (ref 2 a-z).

The present invention disclosed a novel methodology for the production of Multiphoton absorption processes, and thus provide solution in water and aquaculture treatment sites, mass production of bottled mineral waters, microlithography applications, chip manufacturing sites (water, air, lithographic, TOC reductions, TX reduction, UPW) and food, drink, and beverages industries. The methodology of the present invention also increase the efficiencies associated with conventional treatment technologies (a-z) and surface and volume photo treatment applications. Further more, the type of free radical species (OH*) which accelerate the reaction rates during treatment operation are produced according to the methodology of the present invention in a controllable, amplified, logged, and monitored multiprocessing reaction processes forming a platform for unique high intensity radical jet trajection spatial workstation in situ with fusion abilities to produce high intensity radiation within a predetermined space and/or variable liquid or gas geometries over a predetermined period of time.

Conventional treatment technologies available today include: Heat, ozonation, chlorination, oxidation, Gamma rays, X rays, Y rays, UVA,B,C photons, radio waves, micro-waves, and several types of ionizing radiation, oxidation technologies, AOTs (Advance Oxidation Technologies such as using H2O2/UV, TiO2). These currently used treatment technologies are often dangerous, expensive, and require substantial periodical maintenance and replacements. Furthermore, instrumentation using such ionizing radiation types requires sophisticated support means, and infrastructure safety measurements, further complicating design criteria, and implementation. Several of these radiation types have already confirmed as causing cancer, and public confidence in these technologies at manufacturing plants is declining. Stringent legislation and standards further fuel the need for alternative, safer, more economical methodologies for non interfering treatment. Conventional chemical technologies are limited since there is always the need to clear the liquids, and gases (of the "harmful" chemicals), and remove them from the specific volume to be consumed (i.e. after disinfection, or purification have occurred) once they have finished their useful cycle, or their disinfection, and oxidation activities.

Recent activities in solid state electronics, lasers, and advanced polymer for optronic, laser pumping architectures, all have contributed to production of light sources small enough to be incorporated, or integrated (fig.1, 1-30) into system in close proximities to bottles, lids, corks, packaging production processes, and wide variety of packaging for foods, drinks, and many biotechnology products, and applications. More specifically the benefits of the method according to the present invention may be implemented in many treatment applications of

water, or air, aquaculture, and UPW, drinking, recycling, reclamation or beverages, and mineral water production sites. Further more the novel disclosure according to the methodology of the present invention implement evolution of waveguide technology, and production techniques for creating refractive index profile design in flowing liquid waveguide for partial, or total internal reflection therein for equalizing the concentration of bacteria, viruses, cysts, pathogens, or biological, or organic, non organic, or toxic or noxious species therein (in the flowing liquid "virtual" reactor geometries). Major benefit according to the methodology of the present invention is wherein the flowing liquid light guide is providing in situ continuous cooling to prevent thermal damage to system elements.

The method of the present invention also relates to detoxification and sterilization of surfaces from dangerous bacteria and chemicals contaminating the surface either through normal application or by hostile action (when used not for aseptic filling but for NBC decontamination applications (not shown).

The principle is combination of UV/VIS light with photo catalytic Materials in the context of a real time flowing liquid waveguide of the present invention.

The chemicals (oxidants, photo catalysts) will be sprayed/scattered

(Etc) in the form of liquid solution or suspension stream or droplets or cloud

(Etc) from one or more containers, with the light pulses synchronized so that illumination reaches the active chemicals in the right place (at or near the surface) at the right time. Pretreatment of surfaces with non-volatile materials such as TiO2, ZnO etc is another mode of application of the various components of the invention.

Summary of the Invention:

The present invention relates to a method for executing a photochemical treatment through a jet stream of light transmitting liquid. Said method comprising the following steps;

(a) generating at least one light beam having wavelength, intensity, and duration, effective for an initiated photochemical treatment;

(b) forming at least one unpiped jet stream of light transmitting liquid, said jet having a predetermined launching point, trajectory, and target site, the liquid of said jet having a refractive index (N1) greater than the refractive index (N2) of the surroundings of said jet;

(c) directing said light beam into said jet such that said beam is being guided throughout said jet, locked within along its trajectory towards the target site;

wherein photochemical effects of said guided beam are being utilized for at least one

predetermined photochemical treatment type required between the launching point and the target site.

Various types of photochemical treatments may utilize the new innovative method of the present invention, all of which are based on the same novel advantageous principle of using an unpiped liquid jet as a "flowing wave guide" for a light radiation adapted to the specific required treatment. These various type treatments, their advantages comparing to corresponding treatments using conventional existing methods, and the ways for performing them will be further explained in detail.

According to the present invention a novel methodology is disclosed, for non destructively coupling high intensity beams of light in the germicidal range (220-380) to flowing liquid and gases thus creating a real time flowing liquid wave guiding methodology and for spatial processing using flowing suspended liquid formation having a higher refractive index therein, then the refractive index of the space, air, gas or liquid surrounding it. More specifically, triple guiding; (a) said light spatially locking it inside the flow homogeneously so as to fit variable boundaries formed of a continuum of refractive index profile between said (b) flowing liquid having a higher refractive index (1.33) therein then the (c) air or gas outside it (normally 1.00), and liquid and gases hydraulic, and pneumatic interactions (shapes, and variable space dimensions) into hydro optical fusion geared for photo-induced chemistry, and for sterilization and disinfection of liquids and gases, water, and air or surface combinations.

The present invention discloses a novel methodology for creating a real time flowing liquid wave guide or photochemistry, comprising the following steps; inserting or coupling output from at least one radiation unit having a high intensity pulsed sub-microsecond laser UV light beams into an input opening in a hollow aerobic, non toxic, water projection means being a conduit or a chamber having integral conductive, dielectric, semi conductive or super conductive link having at least one inlet and an outlet launcher shaped for dynamic hydro-optical and photochemical predetermined processing effects and wherein said conduit or chamber having at least one opening un-hindered for passage of liquids and light simultaneously throughout and wherein each of said openings is equipped with optical input or output having predetermined diameter, acceptance angle and biocompatible or photo catalytically immobilized inner or outer surface area layer or thin film coating and at least one venturi suction point sufficiently large for light to be inserted through said opening passage, and sufficiently small for the liquid to remain inside flowing forward in a continuum of laminar or turbulent or combinations flow formats; Pumping simultaneously predetermined volume of liquids or gasses or combinations through said inlet of said water projection means to be processed or triggered by the interactions of said guided light; launching forward simultaneously at least one jet stream having a higher refractive index at about 1.3 or N1, then the air or gas surroundings having a lower refractive index of about 1.00 or N2, such that said jet streams form a refractive index profiles N1/N2 with its surrounding, adequate for

guiding said pulses of light by total internal reflection; guiding or delivering projecting and simultaneously filling packaged liquids or sequentially spatially processing said pulses of light and liquid therein, and throughout or distributing said pulses and liquid directionally to a predetermined surface target site or to said liquid package having a refractive index lower or higher then the flowing liquid light waveguide or N3 or combination N1/N2/N3 and wherein said jet stream may contain at least one bubble; delivering a continuum of predetermined volume of said liquids, and gases simultaneously to said outlet launcher positioned further along said hollow water projection means, at a predetermined pressure volume, or flow rate or combination sufficient for the formation of at least one venturi pressure point at said non hindering opening eliminating the need to use solid state optical grade elements or lenses, reducing the number of elements in the optical path length from air through water to surface reducing attenuation, increasing damage threshold, reducing periodical maintenance and replacements; Adding or subtracting a predetermined oxygen concentration, or singlet oxygen species, or predetermined oxidizer, or photo-catalytic semi conductive metal, or metal oxide particles, or nano porous, or non porous multi-components or semi conductive or dielectric combinations to the flowing liquid jet stream proportionately so as to form radical species or for photolytic, or photo catalytically triggering or for directly photo chemically effecting disinfecting, or sterilizing, dissociating, mineralizing or oxidizing, cleaning or decontaminating said liquid or gases or surfaces or combination in a single simultaneous action within a predetermined period of time.

and guiding the liquid to fit virtual reactor path length, sizes and dimensional geometrical orientation, so as to maximize its photochemical abilities and performances. Especially beneficial wherein the liquid is water, flavored water sea water drinking water, brackish water, water reclamation, water recycling applications, water and wastewater treatment applications, beverages, wine, beer, medical preparation, pharmaceutical suspensions and multi component mixes, and when repeatable industrial operation is required to ensure safety of resources (such as water and air) are maintained continuously.

Especially beneficial for disinfection through the skin of internal blood flow (using the flowing liquid waveguide of the present invention), and bodily fluids without causing any damage, In treating medical instrumentation and engineering tools with pulsed UVA, UVB, UVC laser light guided by the UVJET of the present invention - where the geometrical curvature is often difficult to reach using conventional disinfection, or purification technologies. The method of the present invention is also disclosing a novel methodology wherein the cork, or lid themselves are made of polymer varieties having higher refractive index then the liquids, and/or gases therein (i.e. in the packaging), in order to maximize geometrical utilization.

More specifically, the UVJET of the present invention may be easily scaled up or down modularly. As an example; the methodology of the present invention for surface treatment is also beneficial for improving the hygiene of the mouth by harnessing the illumination or

irradiation of a wave guiding dielectric brush [WDB] sterilizing its complex curvature inner surfaces, and volumes, having variable depth of penetration catalytically using new generation of paste, comprising:

Constructing or integrating a multi-component compound structurally modular, containing predetermined portion of yielding Oxygen Charge (SYOCH) in a U.P.W, PH stabilized, held temporarily or permanently in a 3D polymeric frame work of biodegradable biocompatible carbomer or BI-polymers expanded to contain photo-catalytic, and, or centilating conversion elementally each having predetermined electron charge transfer co.-efficiencies and absorption, refractive index profile, and acoustic properties, selected pre-production for quantum objective application specific efficiencies driven thus from supper conductive, to dielectric, or semi conducting, wherein the flexibility of water may provide generic structurally yielding Oxygen Charge accommodating into manageable forms the decomposed species inactivated radically (SYOCH1), within water, liquid or gas or air suspension, body fluids,or inside mouth using new generation of paste according to the methodology of the present invention.

A method for sterilizing and disinfecting the surface of medical instrumentation, [according to claims 1-100, fig. 1-7] comprising: Preferred mode of utilization for dentistry, general dentists, perio-dentists, orthodontists, exodontists, pediatric dentists, endodontists, oral/maxillofacial surgeons, and orthodontists wherein the duty cycle of procedures thus performed in these respective field when using multicomponent catalytic U.PW based compound or coupling gel, spray, or liquid or gas facilitating the shortening, and time and resources saving, as results of effectively reduction of the population of noxious species on surface or volume, within predetermined area or dimension, thus increasing the level of health, and therapeutic applications of devices according to the methodology of the present invention.

More specifically, the methodology of the present invention also relate to a catalytic tooth paste capable of scintillating or repeatable triggering by using visible, UVA, UVB, UVC, optical triggering signal eliminating the need for repeatable brushing. More specifically the present invention facilitates the dissolving of pluck formation catalytically, scintillating, and deep disinfection, and dissociation therapeutic effective treatment.

In the context of the present invention Acquired immunodeficiency Syndrome means A life threatening disease caused by virus and characterized by breakdown of the body's immune defenses, specie specific calibration standards mean in the context of the present invention the efficient reduction of viruses which causing immunodeficiency syndrome without interfering with the body external surfaces.

In the context of the present invention Active immunity means that the immunity produced by the body in response to stimulation by a disease causing organism or vaccine, or treatment according to the present invention wherein blood is circulated in the body, or in loop to/from

the body through optronic dialysis according to the methodology of the present invention and therapeutic responses are following as a result of the treatment according to the methodology of the present invention.

In the context of the present invention Agamaglobulinemia means an almost total lack of immunoglobulines, and/or antibodies.

In the context of the present invention Allergen means any substance that causes an Allergy, and/or allergic reaction by the malfunctioning of the MHC type 1, 2, 3, and/or any combination thereof.

In the context of the present invention Allergy means An inappropriate and harmful response of the immune system to normally harmless substances (i.e. see Allergic reaction as an example)

In the context of the present invention Anaphylactic Shoch a life threatening Allergic reaction characterized by swelling of the body tissues including the throat, difficulties in breathing, and a sudden fall in blood pressure.

In the context of the present invention Energy means A state of unresponsiveness, induced when the T cell antigen receptor is stimulated, that effectively freezes T cell responses, pending a 2ND Signal from the Antigen presenting cell.

In the context of the present invention Antibody means a soluble protein molecule produced and secreted by B cell in the response to an antigen, which is capable of binding to the specific antigen.

In the context of the present invention Antibody-dependent Cell - mediated Citotoxicity (ADCC) means in the context of the present invention An immune response in which antibody, by coating target cells makes them vandurable to attack by immune cell (see coating and marking cells)

In the context of the present invention Antigen means any substance that, when in traduced into the body is recognized by the immune system.

In the context of the present invention Antigen presenting cells means B cells of the monocyt lineage (including macrophages as s dantritic cells), and various other body cells that present antigen in a form that T cells can recognize.

In the context of the present invention Anti nuclear antibody (ANA) means an autoantibody directed against a substance in the cell nucleus.

In the context of the present invention Antiserum means a Serum that contains antibodies.

In the con text of the present invention the refractive index of water is 1.3, and the refractive index of air is 1.00, thus when light is coupled to a real time flowing liquid wave guide it gets locked, and reflected by T.I.R (Total Internal Reflections) thus creating a light jet (UVJET) according to the methodology of the present invention.

In the context of the present invention Antitoxins mean Antibodies that interlock with and inactivate toxins produced by certain bacteria.

In the context of the present invention Appendix means a lymphoid organ in the intestine.

In the context of the present invention Attenuated means a weakened; no longer infectious (innocuous form)

In the context of the present invention Autoantibody an antibody that reacts against persons own tissue.

In the context of the present invention Auto immune disease diseases that result when the immune system mistakenly attacked the bodies own tissues. For example the Rheumatoid arthritis and systemic lupus erythematosus aree auto immune diseases.

In the context of the present invention Bacterium means a microscopic noxious microorganism composed of a single cell. Mant but not all bacteria cause disease.

In the context of the present invention Bassophile means A white blood cell that contributes to inflammatory reactions. A long with mast cells, Basophiles are responsible for the symptoms of Allergy. (and/or Alergic reactions).

In the context of the present invention B cells means small white blood cells crucial to the immune defenses. Also known as B lymphocites, they are derived from bon Marrow and develop into plasma cells that are the source of antibodies.

In the context of the present invention Biological response modifiers means a substances, either natural or synthesized, that boosts, direct, or restores normal immune defenses. BRMs include interferons, interleukins, thymus hormones and monoclonal antibodies.

In the context of the present invention Biotechnology means the use of living organisms or their products to make or modify a substance. Biotechnology includes recombinant DNA technique (such as genetic engineering), and hybridoma technology.

In the context of the present invention Bon-marrow means soft tissue located in the cavities of the bones. The bone marrow is the source of all blood cells.

In the context of the present invention Cellular immunity means immune protection provided by the direct action of the immune cells (as distinct from soluble molecules such as

antibodies).

In the context of the present invention Chromosomes mean physical structures in the cell's nucleus that have the genes. Each Human cell has 23 pares of chromosomes.

In the context of the present invention Clone A group of genetically identical cells or organisms descended from a single common ancestor., (v) to reproduce multiple identical copies.

In the context of the present invention Complement means a complex series of blood proteins whose action complements the work of antibodies. Complement destroys bacteria produces inflammation, and regulates the immune reactions.

In the context of the present invention Complement cascade means a precise sequence of events usually triggered by an antigen/antibody complex in which each component of the complement system is activated in turns.

In the context of the present invention Constant region means that part of an Antibody structure that is characteristic for each antibody class.

In the context of the present invention Co stimulation means the delivery of a 2nd signal from an antigen-presenting cell to a T cell. The 2nd signal rescues the activated T cell from Anergy, allowing it to produce the lymphokinds necessary for the growth of additional T cells.

In the context of the present invention Cytikines means powerful chemical substances secreted by Cells. Cytokines include lymphokines produced by lymphocytes and monokines produced by monycites and macrophages.

In the context of the present invention Dandritic cells means] white blood cells found in the spleen and other lymphoid organs. Dandritic cells typically use thread like tentacles to enmesh antigen, which they present to T cells.

In the context of the present invention DNA (deoxyribonucleic acid) means a nucleic acid that is found in the cell nucleus and that is the carrier or co. represents genetic information. (I.e. see RNA, Ribonucleic Acid or any combination thereof)

In the context of the present invention Enzyme means a protein; produced by living cells that promotes the chemical processes of life without itself being altered.

In the context of the present invention Eosinophil means a white blood cell that contains granules filled with chemicals damaging to parasites, and enzymes that damp down inflammatory reactions.

In the context of the present invention Epitop means a unique shape or marker carried on

antigen's surface, which triggers a corresponding antibody response.

In the context of the present invention Fungus means a member of a class of relatively primitive vegetable organism. Fungi include mushrooms, yeast, rusts, molds and smuts.

In the context of the present invention Gene means a unit of genetic material (DNA) that carries the directions a cell uses to perform a specific function, such as making a given protein.

In the context of the present invention Graft-versus-host disease (GVHD) means a life threatening reaction in which transplanted immunocompetent cells attack the tissues of the recipient (such as in transplant medical procedures).

In the context of the present invention Granulocytes means A white blood cell file with granules containing potent chemicals that allow the cell to digest micro organisms (noxious types and non noxious types) or to produce inflammatory reactions. Neutrophiles eosinophiles and basophiles are examples of granulocytes.

In the context of the present invention Helper T cells means A subset of T cells that typically carry the T4 marker and are essential for turning on the antibody production, activating cytotoxic T cells, and initiating many other immune responses.

In the context of the present invention Hematopoiesis means the formation and development of blood cells, usually takes place in the bone marrow.

In the context of the present invention History Compatibility Testing means a method of matching the self-antigens (HLA) on the tissues of a transplant donor with those of the recipient. The closer the natch, the better the chance that the transplant procedure will be successful "and will take"

In the context of the present invention HIV means (Human Immunodeficiency virus) it is the virus that causes AIDS.

In the context of the present invention Human lococyte antigens (HLA) means a protein in markers of self use in histocompatibility testing. Soma HLA types also correlate with certain autoimmune diseases.

In the context of the present invention Humoral immunity means an immune protection provided by the soluble factors such as antobodies, which circulate in the body fluids or Humors, primarily Serum and lymph.

In the context of the present invention Hybridoma means A Hybrid cell created by fusing B lymphocytes with as long lived neoplastic plasma cell or T lymphocyte with a lymphoma cell. B cell Hybridoma secretes a signal specific antibody.

In the context of the present invention VOCs reduction means reduction of volatile organic compounds by the use of a flowing liquid wave guide (could be used also for TOC reduction in the same principle)

In the context of the present invention Hypogammmaglobuilinemia means is an abnormally low level of immunoglobuline.

In the context of the present invention Ideotypes means a unique and characteristic part of an antibody variable region, which can dam cells serve as antigens.

In the context of the present invention Immune Complex (IC) means a Cluster of interleukines, antigens and antibodies.

In the context of the present invention Immune response means the reactions of the immune system to foreign substances.

In the context of the present invention Immunoassay means A test using antibodies to identify and quantify substances. Often the antibody is link to a marker such as a fluorescent molecule, a radio active molecule or an enzyme type, or combination of the above

In the context of the present invention Immunocompetent means the capability of developing an immune response.

In the context of the present invention Immunoglobulines means a family of large protein molecules also known as antibodies.

In the context of the present invention Immunosupression means A reduction of the immunresponses for instance by giving drugs to prevent transplant rejection/s.

In the context of the present invention Immunotoxines A monoclonal antibody linked to a natural toxins, a toxic drugs or radioactive substance or combination.

In the context of the present invention Inflammatory response means A redness, warmth, swelling, pain, and/or loss of function produced in response to infection as the result of increased flood flow and an influx of immune cells and secretions.

In the context of the present invention I8nterleukines means A major group of lymphokines and monokines.

In the context of the present invention Kupffer cells means specialized macrophages in the liver.

In the context of the present invention LAK cells means lymphocytes transformed in the laboratory into lymphokines activated Killer cells, which attack tumor cells.

In the context of the present invention Langerhans cells means A drandritic cells in the skin that pick up antigen and transport it to lymph nodes.

In the context of the present invention Leukocytes and all white blood cells.

In the context of the present invention Lymph means a transparent, slightly yellow fluid that carries lymphocytes, bathes the body tissues, and drains into the lymphatic vessels.

In the context of the present invention In the context of the present invention Lymphatic vessels mean a body-wide network of channels, similar to the blood vessels, which transport lymph to the immune organs and into the bloodstream.

In the context of the present invention Lymph nodes mean small bean-shaped organs of the immune system, distributed widely throughout the body and linked by lymphatic vessels. Lymph nodes are garrisons of B, T, and other immune cells.

In the context of the present invention Lymphocyte means small white blood cells produced in the lymphoid organs and paramount in the immune defenses.

In the context of the present invention Lymphoid organs mean the organs of the immune system, where lymphocytes develop and congregate. They include the bone marrow, thymus, lymph nodes, spleen, and various other clusters of lymphoid tissue. The blood vessel and lymphatic vessels can also be considered lymphoid organs.

In the context of the present invention Lymphokines means powerful chemical substances secreted by lymphocytes. These soluble molecules help direct and regulate the immune responses.

In the context of the present invention Macrophages mean a large and versatile immune cell that acts as a microbe-devouring phagocyte, an antigen-presenting cell, and an important source of immune secretions.

In the context of the present invention Major histocompatibility complex (MHS) means a group of genes that controls several aspects of the immune response. MHC genes code for self-markers on all body cells.

In the context of the present invention Mast cells means a granule-containing cell found in tissue. The contents of mast cells, along with those of basophils, are responsible for the symptoms of allergy.

In the context of the present invention Microbes means minute living organisms, including bacteria, viruses, fungi and protozoa.

In the context of the present invention Microorganisms means microscopic plants or animals.

In the context of the present invention Molecule means the smallest amount of a specific chemical substance that can exist alone. (The break a molecule down into its constituent atoms is to change its character. A molecule of water, for instance, reverts to oxygen and hydrogen).

In the context of the present invention Monoclonal antibodies mean antibodies produced by a single cell or its identical progeny, specific for a given antigen. As a tool for binding to specific protein molecules, monoclonal antibodies are invaluable in research, medicine and industry.

Monocyte means a large phagocytic white blood cell which, when it enters tissue, develops into a macrophage.

In the context of the present invention Monokines means powerful chemical substances secreted by monocytes and macrophages. These soluble molecules help direct and regulate the immune responses.

In the context of the present invention Natural killer (NK) cells mean large granule-filled lymphocytes that take on tumor cells and infected body cells. They are known as natural killers because they attack without first having to recognize specific antigens.

In the context of the present invention Neutrophil means a white blood cell that is an abundant and important phagocyte.

In the context of the present invention Nucleic acids means large, naturally occurring molecules composed of chemical building blocks known as nucleotides. There are two kinds of nucleic acids, DNA and RNA.

In the context of the present invention OKT3 means a monoclonal antibody that targets mature T cells.

In the context of the present invention Opportunistic infection means an infection in an immunosuppressed person caused by an organism that does not usually trouble people with healthy immune systems.

In the context of the present invention Opsonize means to coat an organism with antibodies or complement protein so as to make it palatable to phagocytes.

In the context of the present invention Organism means an individual living thing.

In the context of the present invention Parasite means a plant or animal that lives, grows, and feeds on or within another living organism.

In the context of the present invention Passive immunity means immunity resulting from the transfer of antibodies or antiserum produced by another individual.

In the context of the present invention Peyer's patches means a collection of lymphoides tissues in the intestinal tract.

In the context of the present invention Phagosites means a large white blood cells that contribute to the immune defenses by ingesting microbes or other cells and/or forign particles.

In the context of the present invention Plasma cells means a large antibody producing cell that develops from B cell.

In the context of the present invention Platelets mean A granule containing cellular fragments critical for blood clotting and sealing of wounds. Platelets also contribute to the immune response.

In the context of the present invention Plymorphes means short for Poly Morpho Neuclear locosytes or granulocytes.

In the context of the present invention Proteins means an organic compound made up of aminoacids. Proteins are one of the major constituents of plants and animals and human cells.

In the context of the present invention Protozoa means a group of one-celled animals few of, which can cause Human desease (including maleria and sleepoing sickness types)

In the context of the present invention Rheumatoid factor means an auto antibody found in the serum of most persons with rheumatoid arthritis.

In the context of the present invention RNA (Ribonucleic Acid) a nucleic acid that is found in the cytoplasm and also in the nucleus of some cells. One function of RNA is to direct the synthesis of proteins.

In the context of the present invention Scavenger cells means any of the diverse groups of cells that have the capability to engulf and destroy foreign materials, dead tissues, or other cells.

In the context of the present invention SCID mouse a laboratory animal that, lacking enzyme necessary to fashion an immune system of its own, can be turned into a model of the human immune system when injected with human cells or tissues.

In the context of the present invention Serum means a clear liquid that separates from the blood when it is allowed to clot these fluids retains any antibodies that were present in the whole blood.

In the context of the present invention Severe combined immunodeficiency disease (SCID) means a life threatening condition in which infants are born lacking all major immune

defenses.

In the context of the present invention Splin means a lymphoid organ in the abdominal cavity that is important center for immune system activities.

In the context of the present invention Stem cells mean Cells from which all blood cells are derived. The bone marrow is rich in stem cells.

In the context of the present invention Suunit vaccine means a vaccine that uses marely one component of an infectious agent rather then the whole to stimulate an immune response.

In the context of the present invention Supeantigens means a class of antigens, including certain bacterial toxins that unleash a massive and damaging immune response.

In the context of the present invention Suppresser T cells means a subset of T cells that turn off antibody production and other immune response.

In the context of the present invention T cells means small white blood cells that orchestrate and/or directly participate in the immune defenses. Also known as T lymphocytes, they are processed in the thymus and secret lymphokines.

In the context of the present invention Thymus means a primary lymphoides organ, high in the chest where T lymphocyte proliferate and mature.

In the context of the present invention TIL means a tumor Infiltrating Lymphocytes. These immune cells are extracted from a tumor tissue, treated in laboratory and re-injected into the cancer patient.

In the context of the present invention Tissue typing means (see MHC, Major Histocompatibility Testing HCT).

In the context of the present invention Tolerance a state of nonresponsivnes to a particular antigen or group of antigens.

In the context of the present invention Tonsils and adenoids means are a prominent oval massive of lymphoid tissues on either side of the throat.

In the context of the present invention Toxins means agents produced by plants and bacteria, normally very damaging to mammalian cells, that can be delivered directly to target cells by lionkiun gthenm to monoclonal antibodies or lymphokines.

In the context of the present invention Vaccine means a substance that contains antigenic components from an infectious organism by stimulating an immune response (but not disease) it protect against subsequent infection by that organism.

In the context of the present invention Variable region means that part of an antibody structure that differs from one antibody to another.

In the context of the present invention Virus means a sub-microscopic microbe that causes infectious disease. A virus can reproduce only in living cells.

In the context of the present invention Libido- pranic a state of increased vitality (i.e. the word prana, pranic means vitality, or states of ample vitality), or such states in which the body is tuned, and the immune system is at rest, empowered by biological traces of specific origin, and nature. Libido is the sensual drive induced as a result of the body being tuned, and/or referenced, and systems in the body aren't over loaded, and thus a state of improved feelings is induced, i.e. a libido-pranic state.

In the context of the present invention Resonativistic means a state of resonance created when energy of high peak powers is being applied, projected into, coupled to, or are being generated into biomass, such resonance is subject to the expansion In the context of the present invention ration, or density of the holding media, or medium, the term represent a state in which light and sound, ultrasound and mechanical, and physiological process are occurring and causing resonance which when said resonance utilizes the individual resonance of elements, organs, or cells of the noxious species, and could identify, or recognize, separate, sort and inactivate, dissociate, or vibrate said biomass,

In the context of the present invention The following terms included to improve the understanding of photochemistry the specific context have been selected for benefits of clarity and familiarization.

Physical Constants of interest in Ultraviolet and Photochemistry means
Constant
Symbol
Value
Units
Speed of light
c
2.99792458x108
M s (-1)
Charge on electron
e
1.60217733x10(-19)
C
Planck constant
h
6.6260755 x10 (-34)

J s
Boltzmann constant
k
k 1.380658x10 (-23)
J K (-1)
Avogadro number
NA
6.0221367 x 1023
mol (-1)
Gas constant
R
8.31451
J mol (-1) K (-1)

Further Characteristics of light and context explanatory notes are herewith included:

In the context of the present invention Planck Law of Radiation means in the context of the present invention:

Light which has both particle and wave properties. It is transmitted in discrete packets of energy (photons) and yet has a frequency and wavelength. The connection between these two properties is embodied in the Planck flaw of Radiation

In the context of the present invention Photochemical wave changes means in the context of the present invention:

In the context of the present invention the usual wavelength range in Photochemistry is 100 - 1000 nm . Light photons with wavelengths longer than 1000 nm have a photon energy too Small to cause chemical change when absorbed, and photons with wavelengths shorter than 100 nm have so much energy that ionization and molecular disruptions characteristic of radiation chemistry prevail. The total In the context of the present invention photochemical wavelength range is divided up into bands with specific names as given below.

In the context of the present invention Spectral ranges or interest in Photochemistry means in the context of the present invention:

Range Name	Wavelength
Near Infrared	700-10000
Visible	400 - 700
Ultraviolet	
UVA	315 -400

UVB	280-315
UVC	100-280

Little photochemistry occurs in the Near Infrared. Except for some photosynthetic bacteria. Which are capable of storing solar energy at wavelengths out to 980 nm. The Visible range is completely active for photosynthesis in green plants and algae. Also many dyes can undergo photochemical transformations themselves or sensitize reactions in other molecules. Most studies in photochemistry involve the Ultraviolet range. The division into three sub-ranges [UVA, UVB, UVC] is connected with the human skin's sensitivity to ultraviolet light. The UVA range causes changes in the skin that lead to sun tanning. The UVB range can cause sun burning and is known to eventually induce skin cancer. The UVC range is extremely dangerous since it is absorbed by proteins, RNA and DNA and can lead to cell mutations and/or cell death. The UVC range is sometimes called the germicidal range, since it is very effective in inactivating bacteria and viruses. The Vacuum Ultraviolet range is absorbed by almost all substances (including water and air). Thus it can only be transmitted in a vacuum. The absorption of a VUV photon causes one or more bond

Breaks. However, even though photons with wavelengths less than 561.6 nm are capable of splitting the H202 molecule, no photolysis, or proteolysis occurs in this wavelength region because H202 does not begin to absorb ultraviolet light until below 300 nm. This illustrates the first Law of Photochemistry; namely that no photochemical reaction can occur unless a photon/s of light is absorbed.

In the context of the present invention Coherent and incoherent light means Light sources used in photochemistry can either be coherent (all emitted photons are in phase with each other as they propagate) or incoherent (all emitted photons have random phases). All lasers emit coherent radiation and usually at one wavelength. The dispersion is very small so that a laser beam remains at or near its original diameter as it propagates; the light emitted by all other light sources is almost always incoherent. Most of these sources are either "hot element" sources (e.g., the incandescent light bulb) or "plasma" sources (e.g., a fluorescent light tube).

In the context of the present invention Point sources, means Light sources have finite dimensions (e.g., often a cylindrical shape). Emission from such a source is difficult to treat mathematically. It is convenient to mode] these sources as a collection of point sources, in which all light is emitted from the point equally in all directions. The optics treatment for point sources is especially simple.

In the context of the present invention The Terms and concepts associated with the emission of tight, are herewith included for clarity of explanation and to simplify the understanding of

the method of the present invention for real time flowing liquid wave guiding of (light and liquid simultaneously), especially wherein photochemistry is involved, or photochemical polishing (meaning enhancing an already implemented processes such that a larger treatment objective is achieved) is active in the processing according to the present invention:

The light emitted from a source can be viewed in many different ways. In this Section, the various terms that may be used to describe this emission are defined and explained.

In the context of the present invention Radiant energy means:

Radiant energy (Q) is a total amount of radiant emission (J) from a source over a given period of time,

In the context of the present invention Radiant power means:

The radiant power (P) of a source is the rate of radiant energy or total radiant power (W) emitted in all directions by a light source. For example, the radiant power of the Sun is 3-842 x 1026 w. in theory, P, should include all wavelengths emitted by the source; however, ~ is usually restricted to the wavelength range of interest to photochemistry. For example, if a light source were being used for ultraviolet photochemistry, P would be specified for emission in the 200 - 400 nm ultraviolet ranges.

In the context of the present invention Radiant power efficiency means:
The radiant power efficiency (q) is defined as
Q = P/e
Where e is the input electrical power (W) supply.
Radiant emittance or excitance means:
The r Radiant emittance or excitance of a source is the radiant power emitted from an infinitesimal area on the surface of the source.

In the context of the present invention Radiant Intensity means:

The radiant intensity (I) (W sr^(-1)) is the total radiant power P emitted by a source in a given direction about an infinitesimal solid angle.

Radiance means:

Radiance (L) is defined as the radiant power d^2P, emitted from an infinitesimal area dA of the source surface in a given direction about the solid angle di, divided both by the solid angle di) and the orthogonal projected area.

The emittance M from an infinitesimal surface element dA is obtained by integrating L in spherical polar coordinates over the hemisphere of all outward-bound directions above dA.

An isotropic light source is defined as one in which the radiance L is uniform over all

Outward directions. Terms and concepts associated with the receipt of light when light is emitted from a source, it radiates outward at the speed of light, when it impinges on an object, and it may be reflected, transmitted or absorbed. There are several terms that relate to the receipt of light.

Fluence Rate means:
Fluence Rate (E) (W m^(-2) is the radiant power of all wavelengths passing from all Directions through an infinitesimally small sphere of cross-sectional area d, divided by CM

Irradiance means:

Irradiance (symbol E; units W m^(-2) is defined as the total radiant power of wavelengths incident on an infinitesimal element of surface of area as containing the point under consideration divided by as. The following are some important points regarding characteristics and differences between "irradiance" and "fluence rate":

Examples: For a parallel and perpendicularly incident beam, not scattered or reflected, irradiance and fluence rate becomes identical. For any UV source within a three-dimensional volume, the integration of UV irradiance over the interior surface of the volume, normally yields the UV power of the lamp not lasers)., This is not true for UV fluence rate which characterized the use of sub-microsecond pulsed UV lasers in accordance with the methodology of the present invention for UVJET real time flowing liquid light guide.

The appropriate term for UV disinfection is "UV fluence rate" because a

Microorganism can receive UV power from any direction, especially when there is more than one UV lamp in the vicinity. In general usage, the irradiance or fluence rate may be expressed as MW cm^(-2). The irradiance is often incorrectly termed "light intensity" see the proper definition of "radiant intensity" above.

Light dose or fluence means:

The light dose or fluence (symbol H. units J m~2) is the total radiant energy of all

Wavelengths passing from all directions through an infinitesimally small sphere of cross-sectional area dA, divided by dA It is given by the average fluence rate times the exposure tune in seconds. The term UV dose is often used in UV disinfection literature. It represents the UV exposure of a given organism in the germicidal range.

Spectral units means:

All of the terms for tight emission or incidence refer to all relevant wavelengths. One can define spectral derivatives for each of these terms. For example. the light power emission of a LIV lamp is often expressed as the spectral power (W nm^(-1), defined as the power output in a narrow wavelength band divided by the width of the band. The solar spectrum received at the Earth's surface is described in terms of the solar spectrum irradiance. Also the spectral distribution of a lamp emission is often given an a plot of spectral power versus wavelength.

Photon based units means:

Photochemistry involves the interaction of photons of light with molecules and means: the definitions units that are based on photons.

Photon irradiance, photon fluence rate and photon flow means:
Each of the spectral terms can be convened to a corresponding equivalent photon flow and fluence rate ' by dividing the term by the average photon energy in the narrow wavelength band.

Quantum yield means:
The quantum yield (unites) Q is a measure of the photon efficiency of a photochemical reaction. e Is defined as the number of moles of product formed or reactant removed (P) per Einstein of photons absorbed

Line sources means:
When atoms are raised to an excited state, they emit only in very narrow lines with

Virtually no emission between the lines. The low-pressure mercury lamp is a very

Common lamp of this type. Table 3 gives the wavelengths and relative emittance for the emission lines of a low-pressure mercury vapor lamp.

Certain radiation units and associated light sources, (lasers) and lamps emit at longer wavelengths, This is the basis of the very popular fluorescent lamp.

For example, The emission lines of a mercury lamp are only sharp when the pressure of the gas is low (<10 tore). If the pressure is increased, the lamp can carry much more power, but the emission lines broaden. For the same length of lamp (about 120cm), a medium pressure lamp (pressure about 1000 tore) can carry up to 30,000W. These lamps are very common in commercial Systems utilizing ultraviolet light. Figure 5 shows a comparison of the emission of low pressure and medium pressure lamps in the ultraviolet region.

Excimer lamps means:
Excimer lamps arc unique in that they emit in a narrow band of wavelengths. An excimer is an atomic dimmer that is stable only in the excited state and dissociates on decaying to the

ground state. Table 4 gives the wavelengths of sonic of the common excimer lamps.

Examples: Emission wavelengths (or some common excimer lamps

Excimer

Wavelength (nm)

Excimer

Wavelength (nm)

Xe2
172
XeCl
308
KrCl
222
I2
342
Cl2
259

Flash lamps

Flash lamps are similar to continuous wave (CW), but could also operate in (PW), pulsed mode operation, and are lamps that consist of a cylindrical quartz tube with electrodes at each end and filled with a ga.½ (e.g.. xenon). A power supply "fires' the lamps by discharging a large amount of electrical energy in a very short period of time (several us) by applying a very high voltage (10 - 30 kV}. The resulting plasma reaches temperatures of 10,000 - 13,000 K and the emission is essentially that of a blackbody (see Fig. 4). In commercial flash lamp Systems the lamp , a typical "flashed" about 30 times per s, but given a special electronic pulsing circuitry is added, repetition rates could reach Khz regime.

FEL means Free Electron Laser and its derivatives, wherein space charged technologies (such as the Electrostatically Accelerated Free Electron Laser) include an electronic pulsing circuits, charging, or an accelerator (Such as R.F. Linac) is involved in the production of photons (around 100, 000,000 photons per electrons, in contradistinction of a conventional crystal based laser having around 1 photon per electron, it is a laser which have less

maintenance associated with its operation and its wall plug efficiency is reaching around the 40-51% respectively, and respectfully of the exact pumping geometry used.

The term EAFEL means Electrostaticely Accelerated Free Electron Laser and is an extremely efficient laser pumping geometry wherein recycling of the Accelerated electrons is being performed by utilizing deceleration techniques and its wall plug efficiency is estimated to reach in access of the 55% (amount of light being produced or converted from the electricity being consumed for its operation.

Biologically enhanced or photo-chemically polished drinking water or breathing air means any liquid or gas which have been passed through or processed by the method of the present invention such as water and/or air), more specifically such processes involved in the polishing and enhancing may include; Optical inactivation, disinfection, inactivation of DNA and/or RNA replication sequences, Photo catalysis, electro catalysis, a hybrid of photo and electro-catalysis, optical dissociation, physiological dissociation, biomass expansion, filtration (pre/post), physical separation and sorting, reactivation, activation, Sonication, acoustics, electro acoustics, electro-optical treatment (by photons of light), transgressing, or transferring said liquids and gasses through a photonic band gaped wave guides having an aerobic, non toxic passage for light and liquids or gasses or combination together, synchronously and or separately.

Peak power means, the energy generated when squeezing (i.e. such as when pulsing) electromagnetic energy in short duration of time, for example: a pulse of a given average energy and power – lasting, or having a pulse width of around 1 second (1s) will generate several watts in peak power, a pulse lasting or having width of microseconds (ms) will generate peak powers reaching the kilo-watts scale, while a pulse lasting nano (ns) seconds will generate peak powers reaching into the hundreds of million of watts which is especially beneficial for purposes such as optical dissociation, optical inactivation, optical polishing, and optical secretion and spectroscopy for control and diagnostics, so in short the shorter the pulse duration the higher its respective peak power.

Multi-photon – absorption - processes means a processes which when harnessed could be very beneficial for the photochemistry involved in the processing according to the present invention, for example when 10mj of energy (250,000 photons) are projected into a liquid or gas, the time it takes this projection is very important, if these photons will be furnished over 1 second time domain, then it leaves sufficient time for the electrons in said liquid or gasses molecules, to relax back to the relaxed state before an additional photon is absorbed, but if we apply these photons in a time domain of 5 nano seconds, then we do not leave time for the electrons to relaxed and the processes is called Multiphoton absorption processes, this processes are non linear in nature and yield much higher quantum yield , or efficiencies, or speed of the reactivation, or a more efficient methodology for optical treatment, processing and polishing

A hybrid of light sources means plurality of light sources and wherein their total spectral emittance, or total spectral distribution, or their total irradiance will cause Multiphoton absorption processes by means of super imposing their time domain (example: 1 light source is slow = 1s pulse duration, and additional light sources are very fast =5ns laser for example), their total irradiance is great and beneficial for the processes of the method of the present invention to occur efficiently, further more, such hybridization could includes, lamps and lasers, lasers and flash lamps, or any combination of CW, or PW type of light source working together, in synchronicity, and or sequentially or link or resolved by time domain manipulation for maximizing photonic interaction in matter, especially beneficial for triggering the catalytic scintillating elemental compound according to the present invention.

Photo catalysis means: The use of energy of a photon of light to catalyze chemical reactions. More specifically, such reaction may include the decomposition of water into hydrogen, and oxygen, and the complete oxidation of organic contaminants in aqueous environments. More specifically, the first step in Photo catalysis is for the catalyst material to absorb photon of light in order to excite an electron from the valance band (VB), to the conduction band (CB), thus creating electron-hole-pairs. Each Species must then migrate to the surface before recombination occurs. If this condition is met, the electron can be transferred to a surface adsorbed molecule, reducing it. The overall process is illustrated, it is important to note that for the processes to occur efficiently (preventing pre-matured recombination of the said electron-hole pairs), the rates of reduction, and the oxidation must be comperable.The position of the band edges is critical for each step of the process, a photocatalyst material which is stable in water is tio2, (or known as Titanium Oxide).

Electro catalysis, similar to that explained in photo-catalysis, but instead of photons, an electrical charge is used, through the use of semiconductor material which has been specially selected (its band gap) for the charge applied, for the context of the present invention an electro catalysis, stable in water is I.T.O, or known in its chemical name and signature Indium Tin oxide). Further more, it is especially beneficial to combine, and operate both electro catalysis and photo-catalysis simultaneously, or serially, or sequentially or in unison, or each separate catalytic is triggered separately in order to maximize the collective efficiencies, thus harnessing and improving the performance of current and future catalytic technological evolution according to the methodology of the present invention. This process may be beneficially harnessed and simultaneously applied in unison or in sequences, or in step time or in any combination thereof. The method of the present invention also relates to detoxification and sterilization of surfaces from dangerous bacteria and chemicals contaminating the surface either through normal application or by hostile action (when used not for aseptic filling but for NBC decontamination applications (not shown).

The principle is combination of UV/VIS light with photo catalytic Materials in the context of a real time flowing liquid waveguide of the present invention.

The chemicals (oxidants, photo catalysts) will be sprayed/scattered

(Etc) in the form of liquid solution or suspension stream or droplets or cloud

(Etc) from one or more containers, with the light pulses synchronized so that illumination reaches the active chemicals in the right place (at or near the surface) at the right time. Pretreatment of surfaces with non-volatile materials such as TiO2, ZnO etc is another mode of application of the various components of the invention.

Detailed description of the Invention:

The present invention discloses a novel methodology for creating a real time flowing liquid wave guide or photochemistry, comprising the following steps; inserting or coupling output from at least one radiation unit having a high intensity pulsed sub-microsecond laser UV light beams into an input opening in a hollow aerobic, non toxic, water projection means being a conduit or a chamber having integral conductive, dielectric, semi conductive or super conductive link having at least one inlet and an outlet launcher shaped for dynamic hydro-optical and photochemical predetermined processing effects and wherein said conduit or chamber having at least one opening un-hindered for passage of liquids and light simultaneously throughout and wherein each of said openings is equipped with optical input or output having predetermined diameter, acceptance angle and biocompatible or photo catalytically immobilized inner or outer surface area layer or thin film coating and at least one venturi suction point sufficiently large for light to be inserted through said opening passage, and sufficiently small for the liquid to remain inside flowing forward in a continuum of laminar or turbulent or combinations flow formats; Pumping simultaneously predetermined volume of liquids or gasses or combinations through said inlet of said water projection means to be processed or triggered by the interactions of said guided light; launching forward simultaneously at least one jet stream having a higher refractive index at about 1.3 or N1, then the air or gas surroundings having a lower refractive index of about 1.00 or N2, such that said jet streams form a refractive index profiles N1/N2 with its surrounding, adequate for guiding said pulses of light by total internal reflection; guiding or delivering projecting and simultaneously filling packaged liquids or sequentially spatially processing said pulses of light and liquid therein, and throughout or distributing said pulses and liquid directionally to a predetermined surface target site or to said liquid package having a refractive index lower or higher then the flowing liquid light waveguide or N3 or combination N1/N2/N3 and wherein said jet stream may contain at least one bubble; delivering a continuum of predetermined volume of said liquids, and gases simultaneously to said outlet launcher positioned further along said hollow water projection means, at a predetermined pressure volume, or flow rate or combination sufficient for the formation of at least one venturi pressure point at said non hindering opening eliminating the need to use solid state optical grade elements or lenses, reducing the number of elements in the optical path length from air through water to surface

reducing attenuation, increasing damage threshold, reducing periodical maintenance and replacements; Adding or subtracting a predetermined oxygen concentration, or singlet oxygen species, or predetermined oxidizer, or photo-catalytic semi conductive metal, or metal oxide particles, or nano porous, or non porous multi-components or semi conductive or dielectric combinations to the flowing liquid jet stream proportionately so as to form radical species or for photolytic, or photo catalytically triggering or for directly photo chemically effecting disinfecting, or sterilizing, dissociating, mineralizing or oxidizing, cleaning or decontaminating said liquid or gases or surfaces or combination in a single simultaneous action within a predetermined period of time.

The present invention disclosed a novel methodology for guiding pulsed sub micro second laser light beams in a real time flowing liquid waveguide forming a refractive index profile with the air (or gas) (surrounding it) around it.

The method of the present invention also relates to detoxification and sterilization of surfaces liquid or gases from dangerous bacteria and chemicals contaminating the surface (or volume) either through normal application or by hostile action (when used not for aseptic filling but for NBC decontamination applications (not shown).

The principle is combination of UV/VIS light with photo catalytic Materials in the context of a real time flowing liquid waveguide of the present invention.

The chemicals (oxidants, photo catalysts) will be sprayed/scattered

(Etc) in the form of liquid solution or suspension stream or droplets or cloud

(Etc) from one or more containers, with the light pulses synchronized so that illumination reaches the active chemicals in the right place (at or near the surface) at the right time. Pretreatment of surfaces with non-volatile materials such as TiO2, ZnO etc is another mode of application of the various components of the invention.

By inserting at least one UV beam of pulsed sub-micro second laser light from at least one radiation unit having a high intensity peak power source of light into at least one venturi input of a biocompatible UV water or liquid jet projector means, or fiber driven, and/or direct exposure of plurality of pulsed laser beams driving UVJET array of inputs and wherein at least one of said JET streams from said liquid or water have a refractive index of around 1.3 (N1=1.33); Projecting predetermined volume or flow rate from said water or liquid jet stream (N1) forward hydro dynamically and hydro-optically into air having a refractive index of about 1.00 (N2=1.00) or through said air (N2), onto surface or combination (N3) (N1+N2+N3) such that the water or liquid jet stream have sufficient geometrical angular integrity to form a refractive index profile with its surrounding air or gas (N2) (N1+N2) wherein said sub microsecond pulsed UV beams are guided therein and throughout by total internal reflection

TIR forming high energy density zones(HEDZs) increasing fluence rate and geometrical utilization of the jet stream; Exposing said water or liquid, air or surface or combination to a predetermined spectral distribution over predetermined space over a predetermined period of time from the radiation unit for processing said water or liquid, air or surface to be cleaner more hygienically orientated, biocompatible ensuring more innocuous, more manageable form eliminating noxious species. Especially beneficial for performing aseptic filling and for washing and sterilization of complex surface curvatures simultaneously on a single platform. Especially beneficial for defense applications wherein washing and sterilization and advanced oxidation processes are interwoven into the interoperability and interconnectivity of the UVJET platform according to the methodology of the present invention.

More specifically, the methodology of the present invention eliminating the need to use hardware type reactors, such as cylindrical conduits or chambers for photochemistry and thus saving on reflecting coating of inner surfaces. The present invention eliminates periodical maintenance and replacement associated with conventional optical elements. By eliminating the use of conventional optical elements such as lenses which are subject to damage threshold optically, the method of the present invention discloses means by which UVJET devices using the method of the present invention perform photolytic and photo catalytic processes thus increasing biocompatibility and processing ability therein (in the UVJET, or throughout the UVJET, VISIJET, or EX-RAYJET), or combination thereof.

The present invention reduces and eliminates the need to use conventional optical elements, hence the venturi pressure and suction point at the back of the UVJET water projection means of the present invention. By manipulating the pressure above a certain threshold the pulsed UV laser beams are inserted at the center of the venturi point thus no lenses are required and no additional optical grade elements are needed, no liquid is spilled out due to the venturi suction. This ensures that the periodical maintenance and replacements associated with conventional sterilization methodologies have been substantially reduced using the method of the present invention and a more streamlined optical design (such as that of the UVJET) contains much less optical elements in the beam path reducing losses and removing the barrier of damage threshold allowing the use of much higher average powers, peak powers or combination thereof.

PRIVATE

<TBODY>Ablation in the context of the present invention means the removal of material or tissue by melting, evaporation, or vaporization.

Absorb in the context of the present invention means to transform radiant energy into a different form, usually with a resultant rise in temperature.

Absorbance in the context of the present invention means the ability of a medium to absorb

radiation depending on temperature and wavelength. expressed as the negative common logarithm of the transmittance.

absorption coefficient in the context of the present invention means the amount. of radiant energy absorbed per unit or path-length.

Active medium in the context of the present invention means a medium in which lasing will take place, rather than absorption, at a given wavelength.

afocal in the context of the present invention means literally, "without a focal length"; an optical system with its object and image point at infinity.

air-cooled laser in the context of the present invention means a laser using fans to force air over the laser tube and through the power supply. air-cooled lasers have the benefit of needing no water supply, although the fan noise can sometimes be a disadvantage. Usually only small and medium power lasers are air-cooled. Very small lasers, typically helium-neon, need no fans. Although technically they are "air cooled" via convection, the term is usually applied only to fan-forced cooling.

Amplification in the context of the present invention means the growth of the radiation field in the laser resonator cavity. as the light wave bounces back and forth between the cavity mirrors, it is amp stimulated emission on each pass through the active medium.

Amplitude in the context of the present invention means the maximum value of the electromagnetic wave, measured from the mean to the extreme; put simply, the height of the wave.

Angstrom unit in the context of the present invention means a unit of measurement for a wavelength of light (written a), equal to one ten billionth of a meter (10-10 meter). Occasionally still used.

Anode in the context of the present invention means an electrical element in laser excitation which attracts electrons from a cathode. An anode can be cooled directly by water or by radiation.

Are coatings in the context of the present invention means anti-reflection coatings, used on the backs of laser output mirrors to suppress unwanted multiple reflections which reduce power.

Argon laser in the context of the present invention means a laser filled with argon gas. It gives off green and blue light. The strongest lines are at 514 nm (green) and 488 nm (blue). argons range from small 15 milliwatt 110 volt air-cooled models to large 50 watt 440 volt water-cooled systems. argon lasers are the most common type of light show lasers since they provide

unable brightness at a reasonable cost.

Average power in the context of the present invention means the sums of the energy of all single discrete pulses, in one second, of a pulsed laser.

Autocollimator in the context of the present invention means a single instrument combining the functions of a telescope and a collimator to detect small angular displacements of a mirror by means of its own collimated light.

Axial-flow laser in the context of the present invention means the simplest and most efficient of the gas lasers. an axial flow of gas is maintained through the tube to replace those gas molecules depleted by the electrical discharge used to excite the gas molecules to the lasing state.

axis, optical axis in the context of the present invention means the optical center-line for a lens system; the line passing through the centers of curvature of the optical surfaces of a lens.

Beam diameter in the context of the present invention means the diameter of that portion of the beam which contains 86% of the output power.

Beam expander in the context of the present invention means optical device increasing beam diameter and reducing divergence.

Beam splitting in the context of the present invention means optically splitting a laser beam into two or more beams, of various or identical energies.

Brewster windows in the context of the present invention means the transmissive end (or both ends) of the laser tube, made of transparent optical material and set at brewster's angle in gas lasers to achieve zero reflective loss of vertically polarized light. non-standard on industrial lasers, but a must if polarization is desired.

Brightness in the context of the present invention means the visual sensation of the luminous power of a light beam, as opposed to scientifically measured power of the beam.

Calorimeter in the context of the present invention means an instrument which measures the heat generated by absorption of the laser beam—another way to measure laser power.

Cathode in the context of the present invention means the element providing the electrons for the electrical discharge used to excite the lasing medium.

Co2 laser in the context of the present invention means a laser largely used in industry in which the primary lasing medium is carbon dioxide.

Coaxial gas in the context of the present invention means most lasers welding is done with a shield of inert gas flowing over the work surface to prevent plasma oxidation and absorption, to blow away debris, and to control heat reaction. The gas jet has the same axis as the beam so the two can be aimed together.

Coherent light, coherent radiation in the context of the present invention means radiation composed of wave trains vibrating in phase with each other. Coherent light waves all travel the same direction (spatial coherence) at the same frequency and in phase (temporal coherence). A laser produces coherent light; conventional light sources produce incoherent light.

Collimated light in the context of the present invention means beam light rays traveling parallel to each other.

Collimation in the context of the present invention means the process by which divergent rays are converted into parallel rays.

Convergence in the context of the present invention means the bending of light rays toward each other, as by a positive (convex) lens.

Current saturation in the context of the present invention means maximum flow of electric force in a conductor; in a laser, the point at which further electrical charge will not increase lasing action.

cw in the context of the present invention means an abbreviation of continuous wave of a laser as opposed to pulsed operation.

Depth of field in the context of the present invention means the working range of the beam, a function of wavelength, diameter of the unfocused beam, and focal length of the lens. To achieve a small diameter spot size, and thus a high power density, a short depth of field must be accepted.

Water laser in the context of the present invention means the creation of lasing in the water (i.e. while flowing), thus harnessing the flowing liquid wave guide for the formation of a flowing light guiding cavity which could be utilized to create a water laser.

Dichroic filters and mirrors in the context of the present invention mean a piece of glass with an optical thin-film coating that transmits certain colors (wavelengths), and reflects the remaining colors. diachroic filters are used to combine or eliminate specific colors as needed in a laser projector. Diachroic mirrors are used to maximize the amount of light reflected from a laser of a particular wavelength. Diachroic should be handled with care to prevent damage to the coating. [See also: color box]

Diode laser in the context of the present invention means a semiconductor similar to a led (light-emitting diode) but which produces coherent light. Diode lasers are small and efficient, which has led to their use in compact disc players and pen-type laser pointers. Currently, diode lasers are too dim or expensive for most light show uses. This is likely to change over the next few years. [See also: solid-state laser]

Divergence in the context of the present invention means the angle at which the laser beam spreads in the far field; the bending of rays away from each other, as by a concave lens or convex mirror.

Drift, angular in the context of the present invention means all undesirable variations in output (either amplitude or frequency); angular drift of the beam, measured in mill radians before, during, and after warm-up.

duty cycle in the context of the present invention means the length of time the laser beam is actually cutting, drilling, welding, or heat-treating, as compared to the entire work cycle time.

Electromagnetic wave in the context of the present invention means a disturbance which propagates outward from an electric charge which oscillates or is accelerated. Includes radio waves; x-rays; gamma rays; and infrared, ultraviolet, and visible light.

Emissivity, emittance in the context of the present invention means rate at which emission takes place; the ratio of the radiant energy emitted by a source or surface to that emitted by a blackbody at the same temperature.

Exposure in the context of the present invention means a measure of the total radiant energy incident on a surface per unit area; radiant exposure.

far-field imaging in the context of the present invention means an imaging technique with solid-state lasers that has several limitations: non-uniform energy distribution, very short working distances, and poor control of hole geometry.

fiber optic cable in the context of the present invention means flexible glass or plastic strands made into a cable, used to carry light from one place to another. There are two main types; step index and graded index fiber. Within these two main types there are two further subgroups:

Transmission fibers carry the beam with as little loss as possible. They are used to transmit the laser's light to remotely located projection devices.

Display fibers [also knows as side glow fibers] have no cable jacket, so some light scatters out the side of the strands. The strands themselves look like microscopic neon tubing and become a special effect, such as a laser-lit "whip" or a glowing "rope" wrapped around

objects.

Flash lamp in the context of the present invention means source of powerful light; often in the form of a helical coil and used to excite photon emission in a solid-state laser.

Fluorescence in the context of the present invention means the glow induced in a material when bombarded by light. Brewster windows of fused silica fluoresce in up light, increasing absorption of laser radiation and degrading laser mode and output.

flux in the context of the present invention means the radiant, or luminous, power of a light beam; the time rate of the flow of radiant energy across a given surface.

focus in the context of the present invention means noun: the point where rays of light meet which have been converged by a lens. verb: to adjust focal length for the clearest image.

focal point in the context of the present invention means (same as first definition under "

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;" in laser work,) the focal point of the beam relative to the work surface has a critical effect, such as the depth and shape of drilled holes. when the focal point is at the surface, holes are of uniform diameter. when the focus is below the surface, conical holes are drilled.

folded resonator in the context of the present invention means construction in which the interior optical path is bent by mirrors mounted on corner blocks bolted into pre-aligned position, permitting compact packaging of a long laser cavity.

frequency in the context of the present invention means the number of light waves passing a fixed point unit of time, or the number of complete vibrations in that period of time.

gain in the context of the present invention means another term for amplification, usually referring to the efficiency of a lasing medium in attaining a population inversion. high gain is typically more than 50% per pass of the light wave between cavity mirrors.

Gas discharge laser in the context of the present invention means a laser containing a gaseous lasing medium in a glass tube in which a constant flow of gas replenishes the molecules depleted by the electricity or chemicals used for excitation. The discharged gas can be filtered and 90% recycled for economy.

Gas jet assist in the context of the present invention means an assisting coaxial gas, such as oxygen, argon, or nitrogen, which may be used to achieve very high power levels for cutting certain metals.

Gas transport in the context of the present invention means a laser design, which generates

very high beam power within a fairly small resonator structure. Long electrodes parallel the axis and gas is circulated across the resonator cavity.

Gaussian in the context of the present invention means the "normal curve," or normal distribution, an example of which is the symmetrical bell shape of the holes created by the uncorrected, unfocused laser beam in its optimum mode. A Gaussian laser beam has most of its energy in the center.

has in the context of the present invention means heat-affected zone, or the area where laser beam and metal (or other) surface are in contact.

helium-neon laser in the context of the present invention means ("hene"), laser in which the active medium is a mixture of helium and neon, which is in the visible range. used widely in industry for alignment, recording, printing, and measuring, it is also valuable as a pointer or aligner of invisible co2 laser light.

Heat sink in the context of the present invention means a substance or device used to dissipate or absorb unwanted heat, as from a manufacturing process (or, with lasers, from reflected rays).

Hertz in the context of the present invention means the approved international term abbreviated Hz, which replaces cps for cycles per second.

Image in the context of the present invention means the optical reproduction of an object, produced by a lens or mirror. A typical positive lens converges rays to form a "real" image which can be photographed. a negative lens spreads rays to form a "virtual" image which can't be projected.

Incident light in the context of the present invention means a ray of light that falls on the surface of a lens — or any other object. The "angle of incidence" is the angle made by the ray with a perpendicular to the surface.

Intensity in the context of the present invention means the magnitude of radiant energy (light) per unit, such as time or reflecting surface.

Ion laser in the context of the present invention means a type of laser employing a very high discharge current, passing down a small bore to ionize a noble gas such as argon or krypton. The ionization process creates a population inversion for lasing to occur. A research laser useful for some industrial applications.

Ionization in the context of the present invention means the process by which ions are formed.

Irradiation in the context of the present invention means exposure to radiant energy, such as

heat, x-rays, or light; the product of irradiance and time.

Joule in the context of the present invention means one watt per second; a measurement frequently given for laser output in pulsed operation.

Krypton laser in the context of the present invention means a laser filled primarily with krypton gas. When used with "all-line" or "white" optics, it produces red, yellow, green and blue light. A "red-only" krypton laser uses with specially tailored optics to output a very strong red line at 647 nm.

kryptons are similar to argons (the same tube design can be used for both). However, krypton gas produces less light (output power) than an equivalent volume of argon gas.

Krypton lasers are primarily used when a powerful red light is needed.

Laser in the context of the present invention means "laser" is an acronym derived from "light amplification by stimulated emission of radiation".

A device which produces a coherent beam of light. The beam remains parallel for long distances and contains one or more extremely pure colors.

Light show lasers are usually gas-filled tubes using high voltage current to ionize the gas (cause the gas to glow). Mirrors at each end of the tube help amplify a process called "stimulated emission". Most of the stimulated emission light travels between the two mirrors; between 1%

And 4% comes out of one of the mirrors to create the beam of light that we see.

The gas used determines the color (or colors) of the beam. Gas lasers remain the overwhelming choice for display applications. The four main types used are a helium-neon mixture, argon, krypton, and an argon-krypton "mixed gas" mixture.

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Laser oscillation in the context of the present invention means the buildup of the coherent wave between laser cavity end mirrors. in cw mode, the wave bounding back and forth between mirrors transmits a fraction of its energy on each trip; in pulsed operation, emission happens instantaneously.

Laser rod in the context of the present invention means a solid-state, rod-shaped lasing medium in which ion excitation is caused by a source of intense light, such as a flash lamp.

Various materials are used for the rod, the earliest of which was synthetic ruby crystal.

Light in the context of the present invention means the range of visible electromagnetic radiation frequencies detected by the eye, or the wavelength range from about 400 to 750 nanometers. It is sometimes extended to include photovoltaic effects and radiation beyond visible limits.

Light regulation in the context of the present invention means a form of power regulation in which output power is maintained at a constant level by controlling discharge current.

Luminance in the context of the present invention means commonly called illumination; the luminous or visible flux per unit area on a receiving surface at any given point.

meniscus lens in the context of the present invention means the lens used primarily in co2 lasers by coherent, inc. it has one side convex, the other concave.

Metastable, metastable state in the context of the present invention means unstable condition in which the energy of a molecule is at some discrete level above the lowest, or ground state. It is this condition which is necessary for emission of photons in a laser. (From quantum theory.)

millijoule: one thousandth of a joule.

milliwatt in the context of the present invention means one thousand milliwatts equal one watt. Small lasers' beam powers are measured in milliwatt. For example, a 50 mw laser is one-twentieth of a watt; a 500 mw laser is one-half watt.

Mode in the context of the present invention means a particular functioning arrangement, setup, or condition for laser operation, such as continuous emission, pulses, or grouped pulses. "Mode" also describes the cross-sectional shape of the beam. (See "

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Modulation in the context of the present invention means the ability to superimpose an external signal on the output beam of the laser as a control.

Monochromatic light in the context of the present invention means theoretically, light consisting of just one wavelength. Since no light is completely monochromatic, it usually consists of a very narrow band of wavelengths. Lasers provide the narrowest bands.

Nanometer in the context of the present invention means a unit of length in the international

system of units (si) equal to one billionth of a meter (10-9 meter). Once called a mill micron, it is used to represent wavelength. Abbreviated"nm. "

near field imaging in the context of the present invention means a solid-state laser imaging technique offering control of spot size and hole geometry, adjustable working distance, uniform energy distribution, and easily produced range of spot sizes.

Nd: glass laser in the context of the present invention means a solid-state laser of neodymium: glass offering high power or short pulses, or both, for specific industrial applications.

nd:yag laser in the context of the present invention means a solid-state laser of neodymium: yttrium-aluminum garnet, similar to the nd:glass laser. both are pumped by flash lamps, or diode lasers.

nema in the context of the present invention means national electrical manufacturers' association, a group which defines and recommends safety standards for electrical equipment.

Noise in the context of the present invention means unwanted, minor currents or voltages in an electrical system.

Object in the context of the present invention means the subject matter or figure imaged by, or seen through, an optical system.

Optical density in the context of the present invention means protection factor provided by a filter (such as used in eyewear, viewing windows, etc.) at a specific wavelength. Each unit of OD represents a 10x increase in protection.

Optical pumping in the context of the present invention means exciting the lasing medium by the application of light rather than electrical discharge from anode and cathode.

Output coupler in the context of the present invention means the resonator mirror which transmits light; the one at the opposite end is totally reflective.

Output power in the context of the present invention means the energy per second emitted from the laser in the form of coherent light, usually measured in watts for continuous-wave operation and joules for pulsed operation.

Peek power in the context of the present invention means the power of an individual pulse in a pulsed laser. It is obtained by dividing the pulse energy in joules to the pulse width in seconds. Typical values can be reach mega and giga watts.

Photo acoustic effects in the context of the present invention means arises with the use of

very short-duration high-energy laser pulses, at pulse durations typically below 10 microseconds. Significant amounts of energy are absorbed and a rapid expansion occurs in the tissue, generating an acoustic shock wave that causes mechanical disruption to cellular structures.

Photochemical effects in the context of the present invention means effects that occur from long exposure durations at incident power levels insufficient to cause damaging photo thermal effects. It is an energy dependent process (a function of the total quantity of radiation absorbed rather than its rate of absorption).

Photometer in the context of the present invention means an instrument which measures luminous intensity.

Photon in the context of the present invention means in quantum theory, the elemental unit of light, having both wave and particle behavior. it has motion, but no mass or charge.

Photo thermal effects in the context of the present invention mean the damage mechanism for acute laser injury (i.e. for injury immediately following exposure). The radiation incident at the surface is absorbed in the underlying tissue, increasing the temperature of the tissue to the level at which damage can occur, and laser burns result. It is a power dependent process (a function of the rate at which energy is absorbed rather than the total quantity of energy involved).

Plasma in the context of the present invention means in laser welding, a metal vapor that forms above the spot where the beam reacts with the metal surface. Also used to describe the laser tube (plasma tube, discharge tube) which contains the completely ionized gas in certain lasers.

Polarization in the context of the present invention means restriction of the vibrations of the electromagnetic field to a single plane, rather than the innumerable planes rotating about the vector axis. This prevents optical losses at interfaces between the lasing medium and optical elements. Various forms of polarization include random, linear (plane), vertical, horizontal, elliptical, and circular. Of two polarization components (so-called), s and p, the p component has zero losses at Brewster's angle.

population inversion in the context of the present invention means when more molecules (atoms, ions) in a laser are in a metastable state than in the ground state (a situation needed for sustaining a high rate of stimulated emissions), a "population inversion" is said to exist. Without a population inversion, there can be no lasing action.

Power density: the amount of radiant power concentrated on a surface. Unit's watts per square meters or square centimeters

Pulse energy in the context of the present invention means the energy of a single, brief emission from a laser programmed for pulsed behavior rather than continuous operation. Pulse power can be several times greater than cw

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emission.

Pulse tail in the context of the present invention means pulse decay time, which can be shortened (by using a special mixture of gases) to allow for fast repetition of laser pulses within a given length of time.

Q-switch in the context of the present invention means a device that has the effect of a shutter moving rapidly in and out of the beam to "spoil" the resonator's normal q, keeping it low to prevent lasing action until a high level of energy is stored. Result: a giant pulse of power when normal q is restored.

quasi cw in the context of the present invention means the pulsating of a continuous light into pulsed light by accustom optic, electro optic, electronic, or mechano optical means, so peak powers are reduced, by number of pulses (see rep. rate) are increased.

Radiance in the context of the present invention means brightness; the radiant energy per unit solid angle and per unit projected area of a radiating surface.

Radiant energy in the context of the present invention means energy traveling as wave motion; specifically, the energy of electromagnetic waves (light, x-rays, radio, gamma rays).

Radiant flux: the rate of emission or transmission of radiant energy.

Radiant intensity in the context of the present invention means radiant power, or flux, expressed as emission per unit solid angle about the direction of the light in a given length of time.

Radiant power in the context of the present invention means the amount of radiant energy available per unit; the radiant flux.

reflectance in the context of the present invention means the ratio of the reflected flux to the incident flux, or the ratio of reflected light to light falling on the object.

reflection in the context of the present invention means the return of radiant energy (incident light) by a surface, with no change in wavelength.

refraction in the context of the present invention means the change of direction of propagation of any wave, such as an electromagnetic wave, when it passes from one medium to another

in which the wave velocity is different. Simply put the bending of incident rays as they pass from one medium to another, such as air to water.

Resolution in the context of the present invention means resolving power, or the quantitative measure of the ability of an optical instrument to produce separable images of different points on an object; the capability of making distinguishable the individual parts of an object, closely adjacent images, or sources of light.

Resonator in the context of the present invention means the mirrors (or reflectors) making up the laser cavity containing the laser rod or tube. The mirrors reflect light back and forth to build up amplification under an external stimulus. Emission is through one of them, called a coupler, which is partially transmissive.

Rockwell c in the context of the present invention means a scale or test used to define hardness in metals, particularly steel and titanium.

Solid-state laser in the context of the present invention means a laser where the lasing medium is a solid material such as a ruby rod. These can be optically pumped by a flash lamp or diodes. Solid state lasers also include diode lasers as they use electrically pumped solids to produce light.

Currently, solid-state lasers are too expensive for most light show uses. This may change over the next few years. The most promising solid-state laser uses a material called nd: YAG, which produces infrared light. This can be frequency doubled (second harmonic generation) to produce up to 60 watts of green light at 532 nm. The green light can again frequency doubled (fourth harmonic generation) to produce up light at 266 nm, up to several watts.

Spectral response in the context of the present invention means the response of a device or material to monochromatic light as a function of wavelength.

Stimulated emission in the context of the present invention means when an atom, ion, or molecule capable of lasing is excited to a higher energy level by an electric charge or other means, it will spontaneously emit a photon as it decays to the normal ground state. If that photon passes near another atom of the same frequency which is also at some metastable energy level, the second atom will be stimulated to emit a photon. Both photons will be of the same wavelength, phase, and spatial coherence. Light amplified in this manner is intense, coherent (collimated or parallel), and monochromatic. In short, laser light.

tem in the context of the present invention means abbreviation for transverse electromagnetic mode, the cross-sectional shape of the working laser beam. an infinite number of shapes can be produced, but only a relatively small number are needed for industrial applications. in general, "the higher the tem, the coarser the focusing."

• tem00: a Gaussian-curve mode that is the best collimated and produces the smallest spot of high power density for drilling, welding and cutting.

• tem01: divided into two equal beams for special applications.

Threshold in the context of the present invention means during excitation of the laser medium, this is the point where lasing begins.

Transmission in the context of the present invention means in optics, the passage of radiant energy (light) through a medium.

Transmittance in the context of the present invention means the ratio of transmitted radiant energy to incident radiant energy, or the fraction of light that passes through a medium.

vignetting in the context of the present invention means the loss of light through an optical element when the entire bundle does not pass through; an image or picture that shades off gradually into the background.

Visible light transmission/transmittance in the context of the present invention means the amount of visible light usable to the eye that passes through a filter. As a rule of thumb, as optical density increases, visible light transmission decreases — but not always.

Watt in the context of the present invention means an objective measure of power; in lasers, usually refers to the optical output power, or strength, of a laser beam. Watts are also used in a more conventional sense, to measure electrical power used by a laser. For example, a 10 w (optical) argon laser consumes around 10,000 w of electrical power.

Wave in the context of the present invention means an undulation or vibration, a form of movement by which all radiant energy of the electromagnetic spectrum is thought to travel.

Wavelength in the context of the present invention means the fundamental property of light—the length of the light wave, which determines its color. Common units of measurement (which is usually from crest to crest) are the micron, the nanometer, and (earlier) the angstrom. Visible light has wavelengths extending from about 700 nanometers (red) through orange (~600 nm), yellow (~580 nm), green (~550 nm), blue (~450 nm) and violet (~400 nm).

White-light beam in the context of the present invention means broadly, a laser beam which contains a number of different wavelengths (colors) so the beam appears white. If the beam is passed through a prism or diffraction grating, it is separated into individual laser beams, each of a single specific wavelength.

More specifically, a white-light beam ideally contains twice as much red as green and blue light for correct color balance (see appendix). It can be from a single white-light laser or from two or three lasers whose beams have been combined into a single beam. white-light beams

are primarily used in rgb laser projectors.

see the definition of white-light laser for more information on what constitutes an "equal mixture" of light.

White-light laser in the context of the present invention means many lasers can produce a number of wavelengths (colors) simultaneously. A white-light laser is designed to give a good balance of red, green and blue wavelengths. Usually the laser is intended for an RGB laser projector. (Some models also deliberately add yellow light for specialized 4-colour projectors.) Most white-light lasers use an argon/krypton gas mixture. It is somewhat

Difficult to produce an equal balance of desired colors, and to keep this balance consistent during the lifetime of the laser tube. At present, there are no standards defining the exact wavelengths and color proportions for a laser to be called "white-light".

In addition, the sought-after color balance can be defined either as equal amounts on a photometer, or as visually equal amounts. Since the eye is much more sensitive to green, a visually equal or "photopioctorial visualization balanced" laser has roughly five times more power in red and blue than in green. Most white-light lasers today are not photopioctorial visualization balanced.

Window In the context of the present invention means a piece of glass with plane parallel sides which admits light into or through an optical system and excludes dirt and moisture.

</TBODY>

A further environmental embodiment of the method of the present invention wherein the content of the bottles, conduits, or chambers may be selected from: beverages, wine, medical preparation, juice, drinking water, mineral water, insulin products or medical preparation. Spring water, flavored water, flavored beverages, biological traceable compounds, Drug delivery using water based, and/or expanded or flavored water drinks containing vitamins or nutrients, alcohol, blood products, plasma products, air products, gases for propelling medications, sprays, or any liquid or gasses or hybrid combination thereof.

A Novel environmental embodiment of the present Invention is having a high repetition rate, high peak power laser of the Nd:Yag, or Nd:Glass, or Nd: YLF, type or any combination thereof driving the UVJET, or spatially processing pulsed laser light therein, or throughout, or triggering advanced oxidation processes using oxidizers, or using photo catalytic components such as metal oxides (TiO2, ZdnO3, ITO), or predetermined concentration of singlet oxygen, or oxygen concentration, or O3 ozone, or peroxide or combination and operating in the Fourth Harmonic generation mode (i.e. FHG), a further preferred embodiment of the present

invention is having said solid state (i.e. Nd: Yag type for example), working in the Third Harmonic Generation mode (i.e. THG), a preferred embodiment according to the method of the present invention is having an electrical discharge laser such as an excimer laser operating in wavelength from about 193nm, through to about the 308, and 351nm, and wherein each of said pulses of light is aligned into the content of the bottled liquids or gasses for purifying, disinfecting, and ensuring that DNA, and RNA replication sequences are thus inactivated, providing a non invasive disinfecting methodology wherein light pulses from the laser are penetrating the material from which the bottles, (i.e. conduits or chambers, or bottles, or pipes) are made.

A preferred mode for operation of the UVJET is wherein the wavelength of the pulsed sub microsecond laser is about 266nm, and wherein energy per pulse is from about 1mJ, to about 10 Js, and wherein pulse repetition rate is between about 1Hz to about 100MHz and wherein repetition rates or energy density or cumulative energy per Cm2, or average energy or peak power is selected to fit different applications requiring different doses of energy, and subsequent different volumes of liquid to be simultaneously delivered using the methodology of the present invention.

A preferred embodiment of the present invention wherein the laser light source is selected from (a) Gas discharge laser, (b) diode pumped lasers, (c) plasma discharged lasers, (d) solid state lasers, (e) semi conductor lasers, (f) crystal type of lasers, (g), X-rays pumped lasers, (h) E-beam pumped gas lasers types, or any combination thereof.

(I) FEL (Free Electron Laser amplifier), (j) EA/FEL (Electrostatically Accelerated Free Electron Laser), or organic laser types or any combination thereof.

A preferred embodiment of the present invention wherein the laser light source is tunable from about 1nm to about 3000nm, a further preferred embodiment of the present invention is wherein the laser light source is tunable from about 333nm to about 360nm, and wherein the peak power density of individual pulses reach from about 1nJ/Cm2, to about 50Js/Cm2, and wherein said pulsed laser light source is pulsing at repetition rates from about 1 Hz to about 300MHz thus the preferred embodiment of the present invention is suitable for wide ranging application involving different packaging materials, thus their specie specific optical calibration standards are calculated for a specific biodosimetric value or curve to appropriately correspond (being lower) with damage threshold of the substrate material used in a specific application, or tool, or device.

A preferred embodiment of the present invention especially beneficial for biomedical application, dentistry and periodentistry applications aimed at implementation and for improving the hygiene of the mouth, may include (a) harnessing the illumination or irradiation of a wave guiding dielectric brush [WDB] containing a sub-miniature version of the UVJET of the present invention wherein light is delivered to the UVJET via optical fibers or via direct

optical stirring means embedded in an integrated arm having delivery capacity from about one quarter of a million of photons per Cm2/Second, to about 999 trillion photons per Cm2/ second and wherein said light is delivered to the brush via at least one optical fiber waveguide delivering at least one pulse having peak power or pulse width of between about 7 picoseconds, to about 100 Femtoseconds, or such brush may be driven via direct laser exposure to its input wherein the brush is comprised of a plurality of sub-miniaturized jest according to the method of the present invention. Such brush may take the form of a UVJET, visijet, ex-rayjet, or any combination thereof. This preferred embodiment is especially beneficial for dentistry applications and for periodentistry for purpose of cleaning pluck formation and for sterilizing and cleaning, washing and disinfecting the inner cavity space and root canals of the mouth or teeth.

A preferred mode for operation of the UVJET wherein a high intensity sub-microsecond pulses of laser light are coupled to the venturi suction of the water projection means (UVJET, VISIJET, EX-RAYJET, IRJAT, NIRJET) such that no conventional optical elements are required and wherein such EMRJET is driven by at least one pulse having wavelength of about 266nm and pulse duration or width extending from about 0.1 microsecond to about 100 Atoseconds and wherein pulse repetition rates extend the range from between 1 Hz to about 1GHz (one hertz to about one Giga hertz) to suit adaptation of the real time flowing liquid waveguide to different applications in accordance with the methodology of the present invention. An additional preferred mode for operation is wherein the light is diffused prior to entering the venturi input suction or light may be diffused on entry to the JET stream, or during transversing of the jet stream, or at the end of the jet stream or any combination thereof. An additional preferred mode for operation is wherein multi line laser is coupled to the jet such that more then one wavelength of light may be used simultaneously; this is beneficial for triggering photo reactive components in the jet stream, or for optical marking of the treated area, especially when treating surfaces. A preferred environmental embodiment of the present invention is wherein an arrays of UVJET are driven by at least one high intensity, high repetition rate laser engine for providing aseptic filling for the bottled water and agro-food industries replacing conventional heat based pasteurization processes, reducing their capital costs and providing substantial reduction on periodical maintenance and replacements. More specifically when using wavelength such as 266nm which sits right on the most sensitive action spectrum of DNA (i.e. the Thiamin base in DNA Davidson at al 1969) the methodology of the present invention can aseptically fill, wash and disinfect simultaneously bottled water, flavored water, beverages, juices, drinking water, water for washing, water for cooling, water for heating, blood and bodily fluids (when sub-miniaturized devices using the method of the present invention), for chemical plants, for pharmaceutical production lines, desalination plants, water treatment plants, metropolitan areas in need of cleaning and sterilization from biological contamination, surface areas in need of advance oxidation treatment (AOT).

Advanced Oxidation Technology (AOT) processes for treatment of liquids, gases and

surfaces such as applying hydrogen peroxide (H2O2), ozone, electron beam, UV light etc. are well known. A wide variety of organic contaminants and noxious species of biological origin can be oxidized by AOT. AOT of organic pollutants usually involves hydroxyl radicals as active intermediates, although biological systems may be inactivated by active excited states produced upon direct or indirect light absorption (photosensitization). Photocatalytic oxidations using metal oxides such as TiO2 for decontamination have drawn considerable interest in the last decade for the purpose of cleaning surfaces, water and air.

It is well known that addition of H2O2 to suspension of TiO2 in a water, may improve the photocatalytic oxidation efficiency. This results from the conversion of TiO2 electrons to OH radicals, thus increasing the yield of *OH by both retarding electron-*OH (or hole) recombination and supplying additional *OH radicals by the reduction of H2O2. (Upon accepting an electron the H2O2 molecule dissociates into *OH radical and hydroxyl ion (OH-)).

Although many AOT seem to be highly promising for practical application, the combination of yields, process rates and cost require improvement of processes efficiency, stability and reproducibility. It is widely accepted that without such optimization, commercialization of the promising technological principles will not be forthcoming. More specifically, substantial resources have been assigned to try and locate materials and techniques for improving the geometrical utilization efficiencies in conventional advanced oxidation and photocatalytic reactors.

The present Patent concerns the combination of UV light with other advanced oxidation processes, applying, for example, 266 nm laser UV light at relatively long distances or at hidden volumes and surfaces.

To the best of our knowledge, there is no material, which can reflect UV light without considerable loss, particularly if several reflections are required in order to transmit the light to the site where the treatment of pollutants (chemical as well as biological) takes place. The decreased light intensity on its way to the site where absorption by the oxidizers and/or photocatalyst may induce prohibitive cost.

Furthermore, attempts to use materials such as HGFS (High Grade Fused Silica) SFS (Synthetic Fused Silica) or other thin film techniques as light guides often foul as these often get clogged or can be covered by colloidal deposit and hard water mineral deposits causing hot spots and deterioration of optical performance.

More specifically, such deterioration does not occur using the methodology of the present invention as it is the UVJET boundaries (water/air) which are used to reflect light within the jet stream itself making a virtual reactor type, not hindered by conventional material limitations. Furthermore, the water jet involves continuous renewal of the liquid/air interface and therefore

contamination and foul of the surface is minimized. Furthermore, research and commercialization works conducted to date in the arena of advanced oxidation and photocatalysis often use UV lamps requiring optical elements, which are themselves subject to damage threshold and deterioration of optical performance after prolonged use, or wherein the energy density is high. The method of the present invention surpasses these limitations by inserting high power pulsed sub microsecond UV laser light into the venturi suction point on the water projection means such that no conventional optical lenses or optical elements are needed. This increases the energy, which can be coupled to a single platform and remove damage threshold limitation.

The present invention disclosed a novel methodology wherein the oxidizer such as H2O2 and/or photocatalyst materials such as TiO2, ZnO, ITO (XXdelete ITO) and other semi-conducting metal particles or suspension are added to the real time flowing liquid waveguide prior to, during, or after or in combination to the launching of the UVJET stream into air, or wherein directionally applying said UVJET stream onto a predetermined surface target site. This allows the methodology of the present invention to activate or initiate the oxidation or photocatalytic processes within the jet stream, or (better) at the tip of the jet stream for surface or volume treatment. Light can be introduced into the jet or be projected externally at specific point along the jet stream. When UV laser pulses are introduced (sub-microsecond pulsed UV laser beams for example) to the flowing jet stream bouncing and reflecting within the jet stream by total internal reflection TIR (N1) having a higher refractive index then the surrounding air (N2) at 1.00.

As a result of the refractive index profile thus created, UV pulsed laser light undergoes multiple reflections within the jet stream, which contain said oxidizers, or said photocatalyst materials and thus within the angular limitation for the coupling and delivery or guiding of light therein, the method of the present invention provide unique geometrical utilization using no hardware type reactor vessel, eliminating head - loss associated with conventional reactor types and eliminating the need to search for appropriate reflecting coating which does not exist sufficiently efficient for such deep UV wavelength of light, such that ensures appropriate absorption by oxidizers, semi conductor metal oxides.

Therefore the method of the present invention does not suffer from the limitations of conventional light guide systems, when applying AOT is consideredIt can be utilized for delivery, initiation and triggering both advanced oxidation processes, and photocatalysis on a single platform wherein no hardware reactor type is needed and the boundaries of the jet eliminates the need to develop reflecting coating for the deep UV substantially reducing the capital cost and periodical maintenance and replacements associated with conventional methods. The present invention may indeed be suitable for using both Advanced Oxidation materials and photocatalytic processes together in line with the unique platform in which geometrical utilization is increased as long as angular optical orientation (such as jet stream

angular orientation compared with the coupled/delivered light throughout) is maintained.

a preferred embodiment of the present invention is wherein the inner walls of the jet is coated with at least one layer or thin film of semi conductor metal oxides such as TiO2, ZnO, ITO in order to ensure no bio-film growth may accumulate, or for ensuring the biocompatibility and cleanliness of the water projection means at all times. More specifically, such coating or film once exposed to the pulsed laser light reflecting through the jet (before it is launched into air or surface) will produce electron holes and subsequent free radical formation having extremely short life times. These free radical species (i.e. such as hydroxyl radicals) are potent ensuring the surface of the inner walls of the water projection means are remaining clean and sterilized at all times during continuous operation. This will ensure continuous industrialized operation without the need to stop operation for cleaning procedures such as conventional CIP procedures in wide variety of industries.

An additional preferred mode for use of the UVJET is wherein 20ns, 80MHz laser beam is coupled to the venturi suction input on the water projection means (UVJET) and wherein the jet is washing, disinfecting, cleaning and dissolving, mineralizing and oxidizing noxious species which may contaminate five gallon water or flavored water jugs (20 liters jugs). An additional preferred mode for utilization of the UVJET is wherein washing and filling and sterilization is occurring simultaneously in order to streamline current water production techniques and to provide a continuum of quality assurance process using the UVJET devices according to the methodology of the present invention.

An additional environmentally friendly preferred embodiment of the present invention wherein the UVJET stream is conducting electrical current or the jet stream or water projection means may be semi conducting or said water projection means or jet stream it is producing is super conducting or dielectric or any combination thereof. A further preferred mode for interoperability and interconnectivity featuring valuable mechanism in which the UVJET of the present invention may be adapted to suit different applications in bottled water industries, biomedical, bio-photonic and environmental or agricultural applications. In the later (agricultural, biomedical) specially adapted suspensions or mix (i.e. multi components water based suspensions) are passed through the jet stream in order to perform photochemical processes such as sterilization, disinfection, advanced oxidation, mineralization, cleaning and washing, dissociation and excitation, triggering of photo reactive species, or fluorescent species or quenching or completing dangerous oregano-phosphorous species in a single action or plurality of washing sequences or combinations programmable for the purpose of treating human skin, decontaminating it (from biological/chemical contaminants), or for treating larger metropolitan surface area in need of washing and simultaneously sterilizing or oxidizing the contamination into more innocuous, more manageable forms. More specifically the methodology of the present invention disclosed a novel methodology for performing both oxidation and sterilization simultaneously, on the same single technological platform. More

specifically treatment of chemical and biological species may be achieved using the methodology of the present invention. This is achieved using the principles of internal reflection within the jet stream to trigger photosensitive species, singlet oxygen species, oxidizers such as h202 and utilization of semi conducting metals such as TiO2 photo catalyst. The use of TiO2 photo catalyst and similar materials may assist in keeping the inner surfaces of the water projection means clear, clean, sterilized and free of bio-film formation as free radical species are formed on the surface upon absorption of photons having sufficient electron volts (about 3.4 eV for strong effect/absorption of the photo catalyst) to create electron pair holes on said inner surface. More specifically a hybrid combination is proposed for achieving higher efficiencies wherein both: oxidizer species such as h202 and photo catalyst such as TiO2 are used together synchronously or simultaneously. Such preferred embodiment may be suitable for deep cleaning actions or for removal of already formed thick layers of noxious species of biological origin, and/or chemical contamination compounded volumes.

The method of the present invention may include variable use of electrical current conducted along the body of the water projection means, peak power of UV light (sub-microsecond to achieve/maximize peak powers) conducted along the jet stream and through the water projection means and combination applied to the external body or geometry of the jet stream (i.e. along the air or gas surrounding the jet stream, refractive index of about 1.00).

A preferred mode for operation of devices using the methodology of the present invention is wherein additional pulsed laser beams are inserted, superimposed, or projected into or onto the jet stream externally from air, or gas. Once these pulsed beams are entering the jet stream from an adequate angle to minimize optical losses (Fresnel reflections and raley scattering type losses) then higher energy density zones are formed within the UVJET streams increasing or decreasing the rates in which predetermined photochemical process are been pursued.

A additional environmental protection preferred embodiment is herewith disclosed in which the flowing liquid light guide contain bubbles for diffusing the light therein, or for reducing the active liquid medium volume to be treated in a predetermined path length optically, or for a specific jet stream length or volume or combinations. More specifically, bubbles may be inserted or added to the flowing liquid wave guide in order to reduce actual treated volume and increase diffusion of the light therein. More specifically said bubbles may be already designed such that they add or subtract from photolytic, or photo catalytic or combination upon interaction with the light prior to the light entering the jet stream, or prior to the light beams entering the water projection means, or after the light is reflecting through the jet stream or any combination thereof. The use of bubbles may include singlet oxygen, hydrogen, nitrogen or any preferred gas having composition or properties appropriate to achieve the desired photolytic, photo catalytic or advanced oxidation processes according tote method of

the present invention.

A preferred mode for operation of devices using the method of the present invention is wherein a single laser station is coupled to a plurality of waveguides (solid state harness of fibers, multi tailed, such as HGFS/SFS/PCF types). This preferred embodiment have a specific advantages as a plurality or set or array of UVJET may be linked via optical fibers such that at the filling point there is 100% electrical safety, yet aseptic filling operation would not have to be disturbed for special CIP procedures or for cleaning or disinfection procedures (i.e. automatic cleaning procedures in almost all agro-food production sites). This unique utilization mode provides a substantial reduction on the periodical maintenance and replacement required for smooth 24/365 industrialized operation.

Another preferred embodiment of the present invention is wherein there light from at least one high peak power, high intensity, high repetition rate laser engine is coupled directly to a plurality or set or array of UVJET, or visijet, or Ex-rayjet (according to the methodology of the present invention) for surpassing the damage threshold of conventional optical fibers enabling direct coupling of high power pulsed UV laser beams in an array of filling nozzles (i.e. array of UVJET) this will provide a good example of the novelty and inventive step of the present invention hence it is eliminating the need to use conventional heat based pasteurization processes requiring heavy investment in infrastructure and lengthy and expensive preparation and utility support means. The UVJET of the present invention provide an evolutionary step reducing substantially the foot print associated with conventional systems or sterilization and aseptic filling, while providing energy conscious design to maximize production through put while minimizing operational and maintenance procedures.

In simple words, in contradistinction to all other current treatment process methodologies, the UVJET devices using the method of the present invention does not damage the sensitive components present in flavored water or other sensitive liquid which passes thru it. for example while other treatment methodologies using heat or chemicals strongly effect the components in multi components mix or beverage often effecting negatively the flavor, freshness and texture of the liquid to be treated thus reducing its over all quality and shelf life. The UVJET according to the methodology of the present invention provide a capable platform which does not interfere with the delicate and often sensitive components present in flavored beverages, pharmaceutical preparation, biomedical and environmental protection applications. Rather it does not cause molecular migration, organoliptic migration and leaves the treated surfaces or volume passed through the water projection means intact. Due to the ability to lock reflecting pulsed laser beam within the jet stream in motion, thermal aberration of treated surface are minimized (the pulse of light in enclosed within the jet stream of water for example during the filling of mineral or flavored water bottles or five gallon jugs). More specifically the jet stream also cools any thermal dynamics caused by the interaction of the peak power of light onto a predetermined surface (i.e. for example: when washing and

disinfecting packaged water products for the bottles water industries).

A preferred embodiment of devices using the methodology of the present invention wherein, a 10 W, average power, pulsed diode pumped UV laser engine is coupled to at least one UVJET water projection means and wherein multi photon absorption processes are occurring within the jet stream having energy of more then one mJ per Cm2 . An additional preferred embodiment is wherein pulse repetition rate into the jet stream or into the water projection means is between 10Hz to about 250Hz. Additional preferred mode for operation is proposed wherein the pulse repetition rates is between 5KHz to about 80MHz and wherein a single laser engine is driving a plurality or set or arrays of UVJET water projection means and wherein wavelength is chosen from the effective wavelength range in photochemistry from between 266nm to about 1000nm. An additional preferred mode for operation is wherein several frequencies of light are used sequentially or in unison or serially to suit different application and reaction rates according to the method of the present invention. A preferred mode for operation using photo catalytic, photolytic or advanced oxidation processes is wherein the wavelength of the delivered light (within the jet stream) is about 266nm. An additional preferred mode for operation especially beneficial for polishing and final photo treatment is wherein the wavelength used is about 355nm in the UV region of the EMR spectrum. A preferred embodiment of the present invention is wherein the UVJET is treating water intake from municipality, or the UVJET may process spring water or aquifer water, or drinking water into/out of distribution pipe networks, or the UVJET may be utilized for aseptic filling, replacing conventional heat based pasteurization, or the UVJET may be used to wash and disinfect inner surfaces of five gallon water or beverage jugs, or the UVJET may assist in washing and decontamination of NBC procedures and cleaning and disinfection of human skin or metropolitan surface area.

An industrialized preferred embodiment wherein the spectrum delivered in the jet stream is visible, additional preferred embodiment is wherein the spectrum of the delivered light through the jet stream is NIR (Near Infra Red), additional preferred embodiments wherein the spectrum of light delivered throughout the jet stream is in the far infra red or combination for optimizing a specific application. Additional preferred mode for operation and interconnectivity is wherein conventional fiber optics are used to drive an arrays of UVJET for the purpose of facilitating aseptic filling, washing and sterilization simultaneously on the same platform. An additional preferred embodiment is wherein the UVJET is used in a sub-miniaturized version to open pluck formation in the main aorta, or in a specific artery or vain or blood vessel (i.e. within small and large blood vessels or veins). A preferred embodiment especially beneficial for biomedical is wherein the UVJET is used to dissolve tumors, and unwanted restenosis or residues using a preferred UPW (Ultra Pure Water) based suspension and photo reactive or photo catalytic components. In addition, for specific treatment using the methodology of the present invention it will be beneficial to use singlet oxygen or any type of oxidizer in order to produce predetermined specific radical species or to provide adequate photolytic dissociation

power to cause a specific photochemical interaction, or reaction rate or combination to suit a predetermined specific application (for example: Bottled water and., Biomedical, bio-photonics, defense, environmental protection applications and so forth).

A preferred embodiment of the method of the present invention is wherein the liquid is a medical preparation, suspension or multi-component mix or solution. A further preferred embodiment is wherein the water projection means is made out of biocompatible metals, additionally, the water projection means may be made out of polymer, or organo elastomer, further preferred embodiment is wherein the water projection means is made out of glass or crystal, this is especially beneficial when scaling down the UVJET according to the methodology of the present invention. Such sub-miniaturized version of the UVJET may be especially beneficial in biomedical domain such as for dentistry and periodentistry applications, cleaning the inner cavity space of the tooth, or for removing pluck formation from tooth and arteries using photo catalysis processes using the UVJET real time liquid waveguide according to the present invention.

An additional preferred embodiment of the present invention is wherein phenton/phenton processes are occurring wherein an oxidizer is added o the flowing liquid waveguide (i.e. to the liquid which conduct the light throughout). A preferred mode for using such processes as the phenton/phenton process is wherein the laser used is a multi line laser, or wherein several lasers or a single laser harmonically or frequency doubled is utilized. A preferred embodiment of the present invention is wherein a predetermined specific wavelength of light is reflected within the jet stream and wherein the same wavelength or a different wavelength is projected into the jet stream externally so as to suit a specific application or reaction rate within available limitations.

An additional preferred embodiment of the present invention is wherein a scale up of the UVJET is used for treatment of wastewater, water reclamation or for treatment of agro-food production waste discharge. An additional preferred embodiment of the present invention is wherein an array of jets (i.e. UVJET showers) are angularly positioned such that they form showers for washing and disinfection and for advanced oxidation processes treating humans, or machine interfaces which have been contaminated. A further recommended preferred embodiment is wherein the laser engine is a Nd:Yag laser engine using THG, FHG, THG (Second Harmonic Generation, Fourth Harmonic Generation, Third harmonic Generation), and wherein its pulse repetition rate is reduced to augment the power per pulse delivered through the UVJET, or arrays of UVJET operating serially, sequentially, or in parallel or in any programmable combination. A further preferred embodiment is wherein the laser engine's pulse repetition rates is increased so as to reach MHz, or GHz class, this may involve using a quasi-CW mode, or mode locked lasers or electrical discharge lasers, or plasma pumped lasers, or electron beam pumped excimers. Selection of the specific laser engine for any preferred embodiment of the present invention will depend on the specific application for

which treatment is required.

A preferred embodiment beneficial for opening drains and for unblocking clogging is wherein the UVJET is operated using direct pulsed UV laser projection into the water projection means, additionally light may be guided into the UVJET using conventional solid state optical fibers, or photonic band-gapped fibers, or photonic band-gapped crystals or combination thereof. A further preferred embodiment of the present invention is wherein the jet stream is surrounded with compressed air or gas so as to be able to add components to the jet stream or in order to maximize optical efficiencies using the UVJET of the present invention.

A further industrialize preferred embodiment of the present invention is wherein the UVJET is stationary positioned for performing aseptic filling procedures in the water industries, additionally the UVJET may be mobile in order to provide swift response to disaster areas, and for treatment or decontamination of human skin or metropolitan areas in the event of biological or chemical terrorist attack. The UVJET may be also utilized to wash vehicles, working surfaces and key building installation providing automatic treatment for both biological and chemical eventualities.

A preferred embodiment of the present invention is wherein light from the laser is passing through an acusto-optical shutter prior to entering the UVJET water projection means. An additional preferred embodiments wherein an acusto-optical modulator is used before or after the pulsed laser beams have entered the water projection means such that the spectral distribution over a predetermined volume over a predetermined surface area (i.e. the dose, or dosimeter value for a specific treatment application), over a predetermined period of time is optimized and may be calculated against specie specific concentration or type of contaminants calibration standards using the method of the present invention.

An additional preferred embodiment of the methodology of the present invention is wherein the jet stream is containing at least one fluorescent component or phosphorous components or photo reactive or photosensitive components for performing treatment or for spectroscopic data acquisition aimed at monitoring the processes of the UVJET according to the methodology of the present invention. A further recommended preferred embodiment is wherein the water projection means contained also transient cavitations, or ultra sound to reduce, or increase the size of bubbles present in the jet stream. This preferred embodiment may be desired in events wherein transient cavitations is applied prior to the pulsed laser light entering the water projection means, or after, or during flowing liquid wave guiding photochemical processes or in any combination thereof.

A preferred embodiment of the present invention is wherein the bubbles contained singlet oxygen, photo reactive species, or photo-catalitic nano particles (NFM). An additional preferred embodiment for devices using the method of the present invention is wherein semi conductive metals particles are present in the jet stream for performing photo catalysis on

surface or volume application such as cleaning of medical instruments, disinfection and cleaning procedures of industrial food processing, decontamination processes and sterilization processes according to the method of the present invention.

A preferred embodiment especially beneficial for photochemistry is wherein photon localization occurs in the liquid (a) or surfaces been treated (b) or both (a+b) by the UVJET devices using the method of the present invention.

Test Data:

1.5 liters Mineral Water Bottles {UVT at 96% min.} filled with UVJET having four energy levels for real time inactivation of 4 species within the jet stream:

- **Ps.Ar, Moulds, E coli, Bacillus Subtilis**

Sample no. (100ml)	UVJET energies				Average C.F.U count post treatment for 4 species		
<3	<2	<3	<3		10	UVJET	1
<2	<1	<2	<2		20	UVJET	2
<1	<1	<1	<1		40	UVJET	3
<1	<1	<1	<1		60	UVJET	4

Operational parameters:

- 4 X References when UVJET OFF = 1.0 106 CFU/100ml (After 7days).
- Flowing liquid waveguide Jet path length 14 cm L/9mm Nominal Optical Diameter beam for
- UVJET Ex-18i, 266nm, 10Hz, 5ns Pulse width, Beam N.O.D. 9mm, energy per pulse 10-60mJ, peak powers at less then 275 Million Watts in energy density per Cm2/Z-plane depth

- Explanatory notes to test data:

These test results illustrate the efficiencies of the method of the present invention and are included to reaffirm and illustrate the geometrical advantages featured by the uvjet of the present invention. Light is locked reflecting within the jet stream by total internal reflection (TIR) increasing the efficiencies associated with inactivation of DNA replication sequences in noxious micro-organisms. Test data reaffirms that no head loses occurred in the virtual reactor geometry featured by the real time flowing liquid waveguide, the uvjet of the present invention.

Remarks:

1. No hardware reactor was used in these tests.
2. No optical elements of any type where used in this test.
3. Multi-photon absorption processes may also account for the high efficiencies as well as the unique creative platform using a jet stream having a higher refractive index (N1), then the surrounding air (N2).

Conclusion:

The UVJET system is able to sterilize liquid efficiently and thus is suitable for aseptic filling application as well as for wide variety of decontaminated applications involving treatment of liquid, gases or surfaces.

Detailed description of the Figures:

The figures according to the method of the present invention illustrate preferred embodiment of the present invention, and block schematics of devices using the methodology of the present invention, and as such, do not intend to limit the scope of the present invention what so ever; figures 1-11, are herewith presented for clarity illustrating competitive advantages, benefits, and modularity in which scaling down or up d design criteria for devices according to the method of the present invention may be performed, and executed.

The figures according to the method of the present invention illustrate preferred embodiment of the present invention do not intend to limit the scope of the present invention what so ever; figures 1-11, together with scientific support data is herewith disclosed:

Figure 1. Figure one illustrate a panoramic view of a real time flowing liquid waveguide wherein pulsed UVA, UVB, UVC light is guided from a water projection means producing a UV jet stream

(1) illustrates the body of the UVJET water projection means, (2) represent the outer rim diameter (smaller then the 5-gallon container inlet/outlet), (3) illustrate water flowing suspended in air (not shown), (4) represent water inlet to the jet, positioned further along the jet length so as to form venturi pressure where pulsed up laser beams of light (not shown) are coupled to the UVJET, (5) illustrates a hollow conduit (full of air, or gas) wherein the laser pulsed UV light beams is having energy per pulse of between 1mJ to about 10 Js per pulse, and wherein wavelength is preferably in the region of 266nm and is trajected, or projected or guided so as to reach the flowing liquid waveguide outlet accurately thus being launched into the flowing jet-stream (not shown), (6) illustrates the outer input end of the laser (the laser is coupled into the guiding pre-pipe (hollow, 6); (7) illustrate the direction from which the laser beam is entering the UVJET, (8) represent the longitudinal orientation of the laser beam represented by the doted line (8), once water are pumped at the jet inlet at the appropriate pressure forming venturi pressure, preventing the water from spilling out of the jet (not shown), simultaneously the laser beam is coupled to the guiding pre-pipe, reaching the jet-stream as it is output the UVJET body, thus forming a flowing liquid waveguide due to the fact that the refractive index of the flowing water (real time) is higher (1.3) then the refractive index of the surrounding air (1.00), the present invention is disclosing novel methodology for the guiding of light through flowing water in real time. The time domain optronic (i.e. sub-microsecond pulse durations) sees the water as standing, thus by T.I.R (Total Internal Reflections) light from the laser (not shown is guided through the UVJET flowing stream of the water), especially beneficial for the washing and disinfection of mineral water 5- gallons containers, bottles, and wide variety of surface, volumes, conduits, and chambers in industrial, agricultural, medical, and environmental, and industrial disinfection and purification applications, or in places wherein washing, and disinfection/sterilization is required

simultaneously to save energy, time, and duty cycle, conserve energy, and increase efficiencies, and protect public health, and the environment X represent an ultra sound transient or static cavitations source input (not shown).

The present invention discloses a novel methodology for creating a real time flowing liquid wave guide or photochemistry, comprising the following steps; inserting or coupling output from at least one radiation unit having a high intensity pulsed sub-microsecond laser UV light beams from 1mJ per pulse to about 10Js per pulse at wavelength of about 266nm and at pulse repetition rates of between 1Hz to about 100MHz into a conduit or chamber integrated with at least one dielectric, semi conductive or super conductive link or interface, having at least one inlet and an outlet launcher shaped for dynamic hydro-optical and photochemical predetermined processing effects and wherein said conduit or chamber having at least one opening un-hindered for passage of liquids and light simultaneously throughout and wherein each of said openings is equipped with optical input or output having predetermined diameter, acceptance angle and biocompatible or photo catalytically immobilized inner or outer surface area layer or thin film coating and at least one venturi suction point sufficiently large for light to be inserted through said opening passage, and sufficiently small for the liquid to remain inside flowing forward in a continuum of laminar or turbulent or combinations flow formats; Pumping simultaneously predetermined volume of liquids or gasses or combinations through said inlet of said water projection means to be processed or triggered by the interactions of said guided light; launching forward simultaneously at least one jet stream having a higher refractive index at about 1.3 or N1, then the air or gas surroundings having a lower refractive index of about 1.00 or N2, such that said jet streams form a refractive index profiles N1/N2 with its surrounding, adequate for guiding said pulses of light by total internal reflection; guiding or delivering projecting and simultaneously filling packaged liquids or sequentially spatially processing said pulses of light and liquid therein, and throughout or distributing said pulses and liquid directionally to a predetermined surface target site or to said liquid package having a refractive index lower or higher then the flowing liquid light waveguide or N3 or combination N1/N2/N3 and wherein said jet stream may contain at least one bubble; delivering a continuum of predetermined volume of said liquids, and gases simultaneously to said outlet launcher positioned further along said hollow water projection means, at a predetermined pressure volume, or flow rate or combination sufficient for the formation of at least one venturi pressure point at said non hindering opening eliminating the need to use solid state optical grade elements or lenses, reducing the number of elements in the optical path length from air through water to surface reducing attenuation, increasing damage threshold, reducing periodical maintenance and replacements; Adding or subtracting a predetermined oxygen concentration, or singlet oxygen species, or predetermined oxidizer, or photo-catalytic semi conductive metal, or metal oxide particles, or nano porous, or non porous multi-components or semi conductive or dielectric combinations to the flowing liquid jet stream proportionately so as to form radical species or for photolytic, or photo catalytically triggering or for directly photo chemically effecting disinfecting, or sterilizing, dissociating,

mineralizing or oxidizing, cleaning or decontaminating said liquid or gases or surfaces or combination in a single simultaneous action within a predetermined period of time.

Figure 2 illustrate an UVJET block schematics comprising:

(14) liquid inlet/input wherein water or liquid gas combination enter the UVJET water projection means, (15) illustrates the input of the laser beam through the venturi pressure zone (not shown), (16) illustrates the physical body enclosure of the UVJET, (13) illustrates the lower refractive index of air surrounding the flowing liquid waveguide (UVJET) having refractive index of 1.00 (the jet has a higher refractive index of 1.3 when using water), (12) represent the actual flowing/guiding water jet stream containing the reflected light therein (in the UVJET), light from the laser is entering the jet (15) then guided by a hollow pipe (15) extending to reach the point wherein the flowing guiding jet stream is output the UVJET body, thus is surrounded by air (13) X represent an ultra sound transient or static cavitations source input (not shown).

The present invention discloses a novel methodology for creating a real time flowing liquid wave guide or photochemistry, comprising the following steps; inserting or coupling output from at least one radiation unit having a high intensity pulsed sub-microsecond laser UV light beams into an input opening in a hollow aerobic, non toxic, water projection means being a conduit or a chamber having integral conductive, dielectric, semi conductive or super conductive link having at least one inlet and an outlet launcher shaped for dynamic hydro-optical and photochemical predetermined processing effects and wherein said conduit or chamber having at least one opening un-hindered for passage of liquids and light simultaneously throughout and wherein each of said openings is equipped with optical input or output having predetermined diameter, acceptance angle and biocompatible or photo catalytically immobilized inner or outer surface area layer or thin film coating and at least one venturi suction point sufficiently large for light to be inserted through said opening passage, and sufficiently small for the liquid to remain inside flowing forward in a continuum of laminar or turbulent or combinations flow formats; Pumping simultaneously predetermined volume of liquids or gasses or combinations through said inlet of said water projection means to be processed or triggered by the interactions of said guided light; launching forward simultaneously at least one jet stream having a higher refractive index at about 1.3 or N1, then the air or gas surroundings having a lower refractive index of about 1.00 or N2, such that said jet streams form a refractive index profiles N1/N2 with its surrounding, adequate for guiding said pulses of light by total internal reflection; guiding or delivering projecting and simultaneously filling packaged liquids or sequentially spatially processing said pulses of light and liquid therein, and throughout or distributing said pulses and liquid directionally to a predetermined surface target site or to said liquid package having a refractive index lower or higher then the flowing liquid light waveguide or N3 or combination N1/N2/N3 and wherein said jet stream may contain at least one bubble; delivering a continuum of predetermined

volume of said liquids, and gases simultaneously to said outlet launcher positioned further along said hollow water projection means, at a predetermined pressure volume, or flow rate or combination sufficient for the formation of at least one venturi pressure point at said non hindering opening eliminating the need to use solid state optical grade elements or lenses, reducing the number of elements in the optical path length from air through water to surface reducing attenuation, increasing damage threshold, reducing periodical maintenance and replacements; Adding or subtracting a predetermined oxygen concentration, or singlet oxygen species, or predetermined oxidizer, or photo-catalytic semi conductive metal, or metal oxide particles, or nano porous, or non porous multi-components or semi conductive or dielectric combinations to the flowing liquid jet stream proportionately so as to form radical species or for photolytic, or photo catalytically triggering or for directly photo chemically effecting disinfecting, or sterilizing, dissociating, mineralizing or oxidizing, cleaning or decontaminating said liquid or gases or surfaces or combination in a single simultaneous action within a predetermined period of time.

Figure 3 (18-25) illustrate a schematic view of devices using the method of the present invention for real time liquid wave guiding of pulsed sub-microsecond UV laser light, and water simultaneously for washing and disinfection/sterilization noxious species on the surface of instruments, fruits, in medical, agricultural, industrial, and domestic cleaning, and purification application, especially beneficial for the protection of public health, and the environment X represent an ultra sound transient or static cavitations source input (not shown).

The present invention discloses a novel methodology for creating a real time flowing liquid wave guide or photochemistry, comprising the following steps; inserting or coupling output from at least one radiation unit having a high intensity pulsed sub-microsecond laser UV light beams into an input opening in a hollow aerobic, non toxic, water projection means being a conduit or a chamber having integral conductive, dielectric, semi conductive or super conductive link having at least one inlet and an outlet launcher shaped for dynamic hydro-optical and photochemical predetermined processing effects and wherein said conduit or chamber having at least one opening un-hindered for passage of liquids .and light simultaneously throughout and wherein each of said openings is equipped with optical input or output having predetermined diameter, acceptance angle and biocompatible or photo catalytically immobilized inner or outer surface area layer or thin film coating and at least one venturi suction point sufficiently large for light to be inserted through said opening passage, and sufficiently small for the liquid to remain inside flowing forward in a continuum of laminar or turbulent or combinations flow formats; Pumping simultaneously predetermined volume of liquids or gasses or combinations through said inlet of said water projection means to be processed or triggered by the interactions of said guided light; launching forward simultaneously at least one jet stream having a higher refractive index at about 1.3 or N1, then the air or gas surroundings having a lower refractive index of about 1.00 or N2, such that

said jet streams form a refractive index profiles N1/N2 with its surrounding, adequate for guiding said pulses of light by total internal reflection; guiding or delivering projecting and simultaneously filling packaged liquids or sequentially spatially processing said pulses of light and liquid therein, and throughout or distributing said pulses and liquid directionally to a predetermined surface target site or to said liquid package having a refractive index lower or higher then the flowing liquid light waveguide or N3 or combination N1/N2/N3 and wherein said jet stream may contain at least one bubble; delivering a continuum of predetermined volume of said liquids, and gases simultaneously to said outlet launcher positioned further along said hollow water projection means, at a predetermined pressure volume, or flow rate or combination sufficient for the formation of at least one venturi pressure point at said non hindering opening eliminating the need to use solid state optical grade elements or lenses, reducing the number of elements in the optical path length from air through water to surface reducing attenuation, increasing damage threshold, reducing periodical maintenance and replacements; Adding or subtracting a predetermined oxygen concentration, or singlet oxygen species, or predetermined oxidizer, or photo-catalytic semi conductive metal, or metal oxide particles, or nano porous, or non porous multi-components or semi conductive or dielectric combinations to the flowing liquid jet stream proportionately so as to form radical species or for photolytic, or photo catalytically triggering or for directly photo chemically effecting disinfecting, or sterilizing, dissociating, mineralizing or oxidizing, cleaning or decontaminating said liquid or gases or surfaces or combination in a single simultaneous action within a predetermined period of time.

Figure 4 illustrate a schematic view of devices using the method of the present invention for real time liquid wave guiding of pulsed sub-microsecond UV laser light (27-30), and water simultaneously for washing and disinfection/sterilization noxious species on the surface of instruments, fruits, in medical, agricultural, industrial, and domestic cleaning, and purification application, especially beneficial for the protection of public health, and the environment X represent an ultra sound transient or static cavitations source input (not shown).

The present invention discloses a novel methodology for creating a real time flowing liquid wave guide or photochemistry, comprising the following steps; inserting or coupling output from at least one radiation unit having a high intensity pulsed sub-microsecond laser. UV light beams into an input opening in a hollow aerobic, non toxic, water projection means being a conduit or a chamber having integral conductive, dielectric, semi conductive or super conductive link having at least one inlet and an outlet launcher shaped for dynamic hydro-optical and photochemical predetermined processing effects and wherein said conduit or chamber having at least one opening un-hindered for passage of liquids and light simultaneously throughout and wherein each of said openings is equipped with optical input or output having predetermined diameter, acceptance angle and biocompatible or photo catalytically immobilized inner or outer surface area layer or thin film coating and at least one venturi suction point sufficiently large for light to be inserted through said opening passage,

and sufficiently small for the liquid to remain inside flowing forward in a continuum of laminar or turbulent or combinations flow formats; Pumping simultaneously predetermined volume of liquids or gasses or combinations through said inlet of said water projection means to be processed or triggered by the interactions of said guided light; launching forward simultaneously at least one jet stream having a higher refractive index at about 1.3 or N1, then the air or gas surroundings having a lower refractive index of about 1.00 or N2, such that said jet streams form a refractive index profiles N1/N2 with its surrounding, adequate for guiding said pulses of light by total internal reflection; guiding or delivering projecting and simultaneously filling packaged liquids or sequentially spatially processing said pulses of light and liquid therein, and throughout or distributing said pulses and liquid directionally to a predetermined surface target site or to said liquid package having a refractive index lower or higher then the flowing liquid light waveguide or N3 or combination N1/N2/N3 and wherein said jet stream may contain at least one bubble; delivering a continuum of predetermined volume of said liquids, and gases simultaneously to said outlet launcher positioned further along said hollow water projection means, at a predetermined pressure volume, or flow rate or combination sufficient for the formation of at least one venturi pressure point at said non hindering opening eliminating the need to use solid state optical grade elements or lenses, reducing the number of elements in the optical path length from air through water to surface reducing attenuation, increasing damage threshold, reducing periodical maintenance and replacements; Adding or subtracting a predetermined oxygen concentration, or singlet oxygen species, or predetermined oxidizer, or photo-catalytic semi conductive metal, or metal oxide particles, or nano porous, or non porous multi-components or semi conductive or dielectric combinations to the flowing liquid jet stream proportionately so as to form radical species or for photolytic, or photo catalytically triggering or for directly photo chemically effecting disinfecting, or sterilizing, dissociating, mineralizing or oxidizing, cleaning or decontaminating said liquid or gases or surfaces or combination in a single simultaneous action within a predetermined period of time.

Figure 5 (31-40) illustrate a schematic view of devices using the method of the present invention for real time liquid wave guiding of pulsed sub-microsecond UV laser light, and water simultaneously for washing and disinfection/sterilization noxious species on the surface of instruments, fruits, in medical, agricultural, industrial, and domestic cleaning, and purification application, especially beneficial for the protection of public health, and the environment (1-70). (36, 37, 38,) illustrates a needle for the insertion of catalysts such as H2O2, TiO2 into the jet stream at the right point (plasma point, focusing, or collimated trajection of pulsed laser UV light beams), X represent an ultra sound transient or static cavitations source input (not shown).

The present invention discloses a novel methodology for creating a real time flowing liquid wave guide or photochemistry, comprising the following steps; inserting or coupling output from at least one radiation unit having a high intensity pulsed sub-microsecond laser UV light

beams into an input opening in a hollow aerobic, non toxic, water projection means being a conduit or a chamber having integral conductive, dielectric, semi conductive or super conductive link having at least one inlet and an outlet launcher shaped for dynamic hydro-optical and photochemical predetermined processing effects and wherein said conduit or chamber having at least one opening un-hindered for passage of liquids and light simultaneously throughout and wherein each of said openings is equipped with optical input or output having predetermined diameter, acceptance angle and biocompatible or photo catalytically immobilized inner or outer surface area layer or thin film coating and at least one venturi suction point sufficiently large for light to be inserted through said opening passage, and sufficiently small for the liquid to remain inside flowing forward in a continuum of laminar or turbulent or combinations flow formats; Pumping simultaneously predetermined volume of liquids or gasses or combinations through said inlet of said water projection means to be processed or triggered by the interactions of said guided light; launching forward simultaneously at least one jet stream having a higher refractive index at about 1.3 or N1, then the air or gas surroundings having a lower refractive index of about 1.00 or N2, such that said jet streams form a refractive index profiles N1/N2 with its surrounding, adequate for guiding said pulses of light by total internal reflection; guiding or delivering projecting and simultaneously filling packaged liquids or sequentially spatially processing said pulses of light and liquid therein, and throughout or distributing said pulses and liquid directionally to a predetermined surface target site or to said liquid package having a refractive index lower or higher then the flowing liquid light waveguide or N3 or combination N1/N2/N3 and wherein said jet stream may contain at least one bubble; delivering a continuum of predetermined volume of said liquids, and gases simultaneously to said outlet launcher positioned further along said hollow water projection means, at a predetermined pressure volume, or flow rate or combination sufficient for the formation of at least one venturi pressure point at said non hindering opening eliminating the need to use solid state optical grade elements or lenses, reducing the number of elements in the optical path length from air through water to surface reducing attenuation, increasing damage threshold, reducing periodical maintenance and replacements; Adding or subtracting a predetermined oxygen concentration, or singlet oxygen species, or predetermined oxidizer, or photo-catalytic semi conductive metal, or metal oxide particles, or nano porous, or non porous multi-components or semi conductive or dielectric combinations to the flowing liquid jet stream proportionately so as to form radical species or for photolytic, or photo catalytically triggering or for directly photo chemically effecting disinfecting, or sterilizing, dissociating, mineralizing or oxidizing, cleaning or decontaminating said liquid or gases or surfaces or combination in a single simultaneous action within a predetermined period of time.

Figure 6 (41-50) illustrate a schematic view of devices using the method of the present invention for real time liquid wave guiding of pulsed sub-microsecond UV laser light, and water simultaneously for washing and disinfection/sterilization noxious species on the surface of instruments,. fruits, in medical, agricultural, industrial, and domestic cleaning, and

purification application, especially beneficial for the protection of public health, and the environment X represent an ultra sound transient or static cavitations source input (not shown).

The present invention discloses a novel methodology for creating a real time flowing liquid wave guide or photochemistry, comprising the following steps; inserting or coupling output from at least one radiation unit having a high intensity pulsed sub-microsecond laser UV light beams into an input opening in a hollow aerobic, non toxic, water projection means being a conduit or a chamber having integral conductive, dielectric, semi conductive or super conductive link having at least one inlet and an outlet launcher shaped for dynamic hydro-optical and photochemical predetermined processing effects and wherein said conduit or chamber having at least one opening un-hindered for passage of liquids and light simultaneously throughout and wherein each of said openings is equipped with optical input or output having predetermined diameter, acceptance angle and biocompatible or photo catalytically immobilized inner or outer surface area layer or thin film coating and at least one venturi suction point sufficiently large for light to be inserted through said opening passage, and sufficiently small for the liquid to remain inside flowing forward in a continuum of laminar or turbulent or combinations flow formats; Pumping simultaneously predetermined volume of liquids or gasses or combinations through said inlet of said water projection means to be processed or triggered by the interactions of said guided light; launching forward simultaneously at least one jet stream having a higher refractive index at about 1.3 or N1, then the air or gas surroundings having a lower refractive index of about 1.00 or N2, such that said jet streams form a refractive index profiles N1/N2 with its surrounding, adequate for guiding said pulses of light by total internal reflection; guiding or delivering projecting and simultaneously filling packaged liquids or sequentially spatially processing said pulses of light and liquid therein, and throughout or distributing said pulses and liquid directionally to a predetermined surface target site or to said liquid package having a refractive index lower or higher then the flowing liquid light waveguide or N3 or combination N1/N2/N3 and wherein said jet stream may contain at least one bubble; delivering a continuum of predetermined volume of said liquids, and gases simultaneously to said outlet launcher positioned further along said hollow water projection means, at a predetermined pressure volume, or flow rate or combination sufficient for the formation of at least one venturi pressure point at said non hindering opening eliminating the need to use solid state optical grade elements or lenses, reducing the number of elements in the optical path length from air through water to surface reducing attenuation, increasing damage threshold, reducing periodical maintenance and replacements; Adding or subtracting a predetermined oxygen concentration, or singlet oxygen species, or predetermined oxidizer, or photo-catalytic semi conductive metal, or metal oxide particles, or nano porous, or non porous multi-components or semi conductive or dielectric combinations to the flowing liquid jet stream proportionately so as to form radical species or for photolytic, or photo catalytically triggering or for directly photo chemically effecting disinfecting, or sterilizing, dissociating, mineralizing or oxidizing, cleaning or decontaminating

said liquid or gases or surfaces or combination in a single simultaneous action within a predetermined period of time.

Figure 7 (51-57) illustrate a schematic view of devices using the method of the present invention for real time liquid wave guiding of pulsed sub-microsecond UV laser light, and water simultaneously for washing and disinfection/sterilization noxious species on the surface of instruments, fruits, in medical, agricultural, industrial, and domestic cleaning, and purification application, especially beneficial for the protection of public health, and the environment X represent an ultra sound transient or static cavitations source input (not shown).

The present invention discloses a novel methodology for creating a real time flowing liquid wave guide or photochemistry, comprising the following steps; inserting or coupling output from at least one radiation unit having a high intensity pulsed sub-microsecond laser UV light beams into an input opening in a hollow aerobic, non toxic, water projection means being a conduit or a chamber having integral conductive, dielectric, semi conductive or super conductive link having at least one inlet and an outlet launcher shaped for dynamic hydro-optical and photochemical predetermined processing effects and wherein said conduit or chamber having at least one opening un-hindered for passage of liquids and light simultaneously throughout and wherein each of said openings is equipped with optical input or output having predetermined diameter, acceptance angle and biocompatible or photo catalytically immobilized inner or outer surface area layer or thin film coating and at least one venturi suction point sufficiently large for light to be inserted through said opening passage, and sufficiently small for the liquid to remain inside flowing forward in a continuum of laminar or turbulent or combinations flow formats; Pumping simultaneously predetermined volume of liquids or gasses or combinations through said inlet of said water projection means to be processed or triggered by the interactions of said guided light; launching forward simultaneously at least one jet stream having a higher refractive index at about 1.3 or N1, then the air or gas surroundings having a lower refractive index of about 1.00 or N2, such that said jet streams form a refractive index profiles N1/N2 with its surrounding, adequate for guiding said pulses of light by total internal reflection; guiding or delivering projecting and simultaneously filling packaged liquids or sequentially spatially processing said pulses of light and liquid therein, and throughout or distributing said pulses and liquid directionally to a predetermined surface target site or to said liquid package having a refractive index lower or higher then the flowing liquid light waveguide or N3 or combination N1/N2/N3 and wherein said jet stream may contain at least one bubble; delivering a continuum of predetermined volume of said liquids, and gases simultaneously to said outlet launcher positioned further along said hollow water projection means, at a predetermined pressure volume, or flow rate or combination sufficient for the formation of at least one venturi pressure point at said non hindering opening eliminating the need to use solid state optical grade elements or lenses, reducing the number of elements in the optical path length from air through water to surface

reducing attenuation, increasing damage threshold, reducing periodical maintenance and replacements; Adding or subtracting a predetermined oxygen concentration, or singlet oxygen species, or predetermined oxidizer, or photo-catalytic semi conductive metal, or metal oxide particles, or nano porous, or non porous multi-components or semi conductive or dielectric combinations to the flowing liquid jet stream proportionately so as to form radical species or for photolytic, or photo catalytically triggering or for directly photo chemically effecting disinfecting, or sterilizing, dissociating, mineralizing or oxidizing, cleaning or decontaminating said liquid or gases or surfaces or combination in a single simultaneous action within a predetermined period of time.

Figure 8 (58-65,a, b, c,) illustrates a schematic view of devices using the method of the present invention for real time liquid wave guiding of pulsed sub-microsecond UV laser light, and water simultaneously for washing and disinfection/sterilization noxious species on the surface of instruments, fruits, in medical, agricultural, industrial, and domestic cleaning, and purification application, especially beneficial for the protection of public health, and the environment, X represent an ultra sound transient or static cavitations source input (not shown).

The present invention discloses a novél methodology for creating a real time flowing liquid wave guide or photochemistry, comprising the following steps; inserting or coupling output from at least one radiation unit having a high intensity pulsed sub-microsecond laser UV light beams into an input opening in a hollow aerobic, non toxic, water projection means being a conduit or a chamber having integral conductive, dielectric, semi conductive or super conductive link having at least one inlet and an outlet launcher shaped for dynamic hydro-optical and photochemical predetermined processing effects and wherein said conduit or chamber having at least one opening un-hindered for passage of liquids and light simultaneously throughout and wherein each of said openings is equipped with optical input or output having predetermined diameter, acceptance angle and biocompatible or photo catalytically immobilized inner or outer surface area layer or thin film coating and at least one venturi suction point sufficiently large for light to be inserted through said opening passage, and sufficiently small for the liquid to remain inside flowing forward in a continuum of laminar or turbulent or combinations flow formats; Pumping simultaneously predetermined volume of liquids or gasses or combinations through said inlet of said water projection means to be processed or triggered by the interactions of said guided light; launching forward simultaneously at least one jet stream having a higher refractive index at about 1.3 or N1, then the air or gas surroundings having a lower refractive index of about 1.00 or N2, such that said jet streams form a refractive index profiles N1/N2 with its surrounding, adequate for guiding said pulses of light by total internal reflection; guiding or delivering projecting and simultaneously filling packaged liquids or sequentially spatially processing said pulses of light and liquid therein, and throughout or distributing said pulses and liquid directionally to a predetermined surface target site or to said liquid package having a refractive index lower or

higher then the flowing liquid light waveguide or N3 or combination N1/N2/N3 and wherein said jet stream may contain at least one bubble; delivering a continuum of predetermined volume of said liquids, and gases simultaneously to said outlet launcher positioned further along said hollow water projection means, at a predetermined pressure volume, or flow rate or combination sufficient for the formation of at least one venturi pressure point at said non hindering opening eliminating the need to use solid state optical grade elements or lenses, reducing the number of elements in the optical path length from air through water to surface reducing attenuation, increasing damage threshold, reducing periodical maintenance and replacements; Adding or subtracting a predetermined oxygen concentration, or singlet oxygen species, or predetermined oxidizer, or photo-catalytic semi conductive metal, or metal oxide particles, or nano porous, or non porous multi-components or semi conductive or dielectric combinations to the flowing liquid jet stream proportionately so as to form radical species or for photolytic, or photo catalytically triggering or for directly photo chemically effecting disinfecting, or sterilizing, dissociating, mineralizing or oxidizing, cleaning or decontaminating said liquid or gases or surfaces or combination in a single simultaneous action within a predetermined period of time.

Figures 9A, 9B, (70 -99) illustrate a schematic view of devices or UVJET array for aseptic filling using the method of the present invention for real time liquid wave guiding of pulsed sub-microsecond laser light comprising:

The present invention discloses a novel methodology for creating a real time flowing liquid wave guide (70-82) for aseptic filling and for industrialized photochemical processing and, comprising the following steps; inserting or coupling output from at least one radiation unit (70) having a high intensity pulsed sub-microsecond (71) laser UV light beams into a multi tail optical waveguide harness (72) each of a plurality of fiber optics shown ((73), (a-e)) is interfaced into a hollow aerobic, non toxic, water projection means (74), (75) being a conduit or a chamber having integral conductive, dielectric, semi conductive or super conductive link (not shown) having at least one inlet and an outlet launcher (74, 75) shaped for dynamic hydro-optical (76), (76a) represent the air or surrounding gas around the jet stream (77) marked with a ring (having lower refractive index then the refractive index of the jet stream). (78) represent the opening in a bottle to be filled using the method of the present invention, (79) represent the body of the bottle, and (80) represent the inner walls of the bottle and photochemical predetermined processing effects and wherein said conduit or chamber having at least one opening un-hindered for passage of liquids and light simultaneously throughout and wherein each of said openings is equipped with optical input or output having predetermined diameter, acceptance angle and biocompatible or photo catalytically immobilized inner or outer surface area layer or thin film coating and at least one venturi suction point sufficiently large for light to be inserted through said opening passage, and sufficiently small for the liquid to remain inside flowing forward in a continuum of laminar or turbulent or combinations flow formats; Pumping simultaneously predetermined volume of

liquids or gasses or combinations through said inlet of said water projection means to be processed or triggered by the interactions of said guided light; launching forward simultaneously at least one jet stream having a higher refractive index at about 1.3 or N1, then the air or gas surroundings having a lower refractive index of about 1.00 or N2, such that said jet streams form a refractive index profiles N1/N2 with its surrounding, adequate for guiding said pulses of light by total internal reflection; guiding or delivering projecting and simultaneously filling packaged liquids or sequentially spatially processing said pulses of light and liquid therein, and throughout or distributing said pulses and liquid directionally to a predetermined surface target site or to said liquid package having a refractive index lower or higher then the flowing liquid light waveguide or N3 or combination N1/N2/N3 and wherein said jet stream may contain at least one bubble; delivering a continuum of predetermined volume of said liquids, and gases simultaneously to said outlet launcher positioned further along said hollow water projection means, at a predetermined pressure volume, or flow rate or combination sufficient for the formation of at least one venturi pressure point at said non hindering opening eliminating the need to use solid state optical grade elements or lenses, reducing the number of elements in the optical path length from air through water to surface reducing attenuation, increasing damage threshold, reducing periodical maintenance and replacements; Adding or subtracting a predetermined oxygen concentration, or singlet oxygen species (not shown), or predetermined oxidizer, or photo-catalytic semi conductive metal, (not shown) or metal oxide particles, or nano porous, or non porous multi-components or semi conductive or dielectric combinations to the flowing liquid jet stream proportionately so as to form radical species or for photolytic, or photo catalytically triggering or for directly photo chemically effecting disinfecting, or sterilizing, dissociating, mineralizing or oxidizing, cleaning or decontaminating (81) illustrates a bacteria being disinfected while the bottle (79) is being filled (70-82) using the method of the present invention said liquid or gases or surfaces or combination in a single simultaneous action (70-82) within a predetermined period of time. The inner surface of the UVJET may be coated by a layer of photo catalytic compounds (not shown) this is to ensure and maximize biocompatibility and ensure no bio-film formation will accumulate, additionally he UVJET water projection hardware may be constructed from an already biocompatible materials not requiring photo catalytic action to remain clean or biocompatible at all times.

The present invention discloses a novel methodology for creating an array of real time flowing liquid wave guides for aseptic filling or for quality assurance using photochemistry, comprising the following steps; inserting or coupling output from at least one radiation unit (84), (83), having a high intensity pulsed sub-microsecond laser UV light beams (86), (91), (97) into a stirring mirror or beam deflector, or prism (87, 88, 89) wherein said deflector position the beams synchronously into the input opening (92), in a hollow aerobic, non toxic, water projection means (95), 94, 92) being a conduit or a chamber having integral conductive, dielectric, semi conductive or super conductive link (not shown) having at least one inlet and an outlet launcher shaped (94, 92) for dynamic hydro-optical (96, 97,) and photochemical

predetermined processing effects (83-99) and wherein said conduit or chamber (98) illustrates a bottled being filled aseptically (the bottled inner surface are being disinfected while said bottle is simultaneously being filled (83-99) having at least one opening un-hindered for passage of liquids and light simultaneously throughout and wherein each of said openings is equipped with optical input or output having predetermined diameter, acceptance angle and biocompatible or photo catalytically immobilized inner or outer surface area layer or thin film coating and at least one venturi suction point sufficiently large for light to be inserted through said opening passage, and sufficiently small for the liquid to remain inside flowing forward in a continuum of laminar or turbulent or combinations flow formats; Pumping simultaneously predetermined volume of liquids or gasses or combinations through said inlet of said water projection means to be processed or triggered by the interactions of said guided light; launching forward simultaneously at least one jet stream having a higher refractive index at about 1.3 or N1, then the air or gas surroundings having a lower refractive index of about 1.00 or N2, such that said jet streams form a refractive index profiles N1/N2 (83-99)with its surrounding, adequate for guiding said pulses of light by total internal reflection; guiding or delivering projecting and simultaneously filling (83-99) packaged, or bottled liquids or sequentially spatially processing said pulses of light and liquid therein, and throughout or distributing said pulses and liquid directionally to a predetermined surface target site or to said liquid package having a refractive index lower or higher then the flowing liquid light waveguide or N3 or combination N1/N2/N3 and wherein said jet stream may contain at least one bubble; delivering a continuum of predetermined volume of said liquids, and gases simultaneously to said outlet launcher positioned further along said hollow water projection means, at a predetermined pressure volume, or flow rate or combination sufficient for the formation of at least one venturi pressure point at said non hindering opening eliminating the need to use solid state optical grade elements or lenses, reducing the number of elements in the optical path length from air through water to surface reducing attenuation, increasing damage threshold, reducing periodical maintenance and replacements; Adding or subtracting a predetermined oxygen concentration, or singlet oxygen species, or predetermined oxidizer, or photo-catalytic semi conductive metal, or metal oxide particles, or nano porous, or non porous multi-components or semi conductive or dielectric combinations to the flowing liquid jet stream proportionately so as to form radical species or for photolytic, or photo catalytically triggering or for directly photo chemically effecting disinfecting, or sterilizing, dissociating, mineralizing or oxidizing, cleaning or decontaminating, filling or washing (83-99) said liquid or gases or surfaces or combination in a single simultaneous action within a predetermined period of time, (99) illustrate the carousel having an array or set of UVJET according to the method of there present invention.

Figure 10, illustrates in a cross sectional view a device for photochemical treatment through a jet stream of light transmitting liquid, comprising liquid jet stream launcher (119) having liquid inlet (121) for receiving liquid from a liquid supply (not illustrated); liquid projection outlet (122) in liquid communication with said inlet; light radiation entrance opening (120) positioned in an

orientation relatively to said outlet appropriate for directing a beam of light into the liquid flow such that said beam of light is being guided within a liquid jet stream projected from said liquid projection outlet (122), locked within along the trajectory of said jet towards a target site. The illustrated embodiment of the device further discloses a wall bracket (123) useful for anchoring the device to either stationary or adjustable support. The liquid enters the device via the inlet (121) is being forced towards the flow stabilizer portion (126) through the spherical groove (127) while performing venturi hydrodynamic - pneumatic differential pressure between the liquid path (through the flow stabilizer portion (126)) and the light/air passage (124). Thus, according to the illustrated embodiment, an air suction operation is performed wherein air entering via the light radiation entrance opening (120) is sucked and mixed into the flowing liquid, thus increasing the diffusion of light within the jet.

The inner surface (129) of the device's hydrodynamic nozzle (128), may be coated with a photo catalytic coating in order to prevent sedimentation during long period use.

Figure 11 illustrates a schematic view of a hydrodynamic nozzle(100) projecting a liquid jet stream (101) having a trajectory (104) which terminates on a target site (109) surface. A light beam (103) is being juided inside the jet stream (101) , and internally refracted several times along the jet trajectory, however, locked inside and tracing its path until reaching (108) the target site. This is due to the refractive index of the liquid that is greater than the refractive index of the surrounding air (102), and from the refractive index of another surrounding gas (e.g. Argon) (105) (that may be dispersed according to various treatment types of the present invention in order to enhance the refractive profile). When the jet stream with the light beam hits the target site (109) surface, the liquid is already purified thanks to the photochemical effects that occur during its flow through the air, however, the target site surface is also become purified around, as pointed out by the arrow icons (106) (107). This is due to the scattering of light reflected all around between the droplets and micro droplets created from the jet while hitting the surface.

Claims:

1. Method for executing a photochemical treatment through a jet stream of light transmitting liquid, comprising;

   (a) generating at least one light beam having wavelength, intensity, and duration, effective for an initiated photochemical treatment;

   (b) forming at least one unpiped jet stream of light transmitting liquid, said jet having a predetermined launching point, trajectory, and target site, the liquid of said jet having a refractive index (N1) greater than the refractive index (N2) of the surroundings of said jet;

   (c) directing said light beam into said jet such that said beam is being guided throughout said jet and locked within along its trajectory towards the target site;

   wherein photochemical effects of said guided beam are being utilized for at least one predetermined photochemical treatment type required between the launching point and the target site.

2. Device for photochemical treatment through a jet stream of light transmitting liquid, comprising liquid jet stream launcher having liquid inlet for receiving liquid from a liquid supply; liquid projection outlet in liquid communication with said inlet; light radiation entrance opening positioned in an orientation relatively to said outlet appropriate for directing a beam of light into the liquid flow such that said beam of light is being guided within a liquid jet stream projected from said liquid projection outlet, locked within along the trajectory of said jet towards a target site.

3. Device for photochemical treatment through a jet stream of light transmitting liquid, comprising (a) Pulsed UV laser; and (b) a liquid jet stream launcher having light radiation entrance opening coupled to a light output of said UV Laser; liquid inlet for receiving liquid from a liquid supply; liquid projection outlet in liquid communication with said inlet; wherein the light radiation entrance opening is positioned in an orientation relatively to said outlet appropriate for directing a beam of light into the liquid flow such that said beam of light is being guided within a liquid jet stream projected from said liquid projection outlet, locked within along the trajectory of said jet towards a target site.

4. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, comprising; inserting or coupling output from at least one radiation unit having a high intensity pulsed sub-microsecond laser UV light beams into an input opening in a hollow aerobic, non toxic, water projection means being

a conduit or a chamber having integral conductive, dielectric, semi conductive or super conductive link having at least one inlet and an outlet launcher shaped for dynamic hydro-optical and photochemical predetermined processing effects and wherein said conduit or chamber having at least one opening un-hindered for passage of liquids and light simultaneously throughout and wherein each of said openings is equipped with optical input or output having predetermined diameter, acceptance angle and biocompatible or photo catalytically immobilized inner or outer surface area layer or thin film coating and at least one venturi suction point sufficiently large for light to be inserted through said opening passage, and sufficiently small for the liquid to remain inside flowing forward in a continuum of laminar or turbulent or combinations flow formats; Pumping simultaneously predetermined volume of liquids or gasses or combinations through said inlet of said water projection means to be processed or triggered by the interactions of said guided light; launching forward simultaneously at least one jet stream having a higher refractive index at about 1.3 or N1, then the air or gas surroundings having a lower refractive index of about 1.00 or N2, such that said jet streams form a refractive index profiles N1/N2 with its surrounding, adequate for guiding said pulses of light by total internal reflection; guiding or delivering projecting and simultaneously filling packaged liquids or sequentially spatially processing said pulses of light and liquid therein, and throughout or distributing said pulses and liquid directionally to a predetermined surface target site or to said liquid package having a refractive index lower or higher then the flowing liquid light waveguide or N3 or combination N1/N2/N3 and wherein said jet stream may contain at least one bubble; delivering a continuum of predetermined volume of said liquids, and gases simultaneously to said outlet launcher positioned further along said hollow water projection means, at a predetermined pressure volume, or flow rate or combination sufficient for the formation of at least one venturi pressure point at said non hindering opening eliminating the need to use solid state optical grade elements or lenses, reducing the number of elements in the optical path length from air through water to surface reducing attenuation, increasing damage threshold, reducing periodical maintenance and replacements; Adding or subtracting a predetermined oxygen concentration, or singlet oxygen species, or predetermined oxidizer, or photo-catalytic semi conductive metal, or metal oxide particles, or nano porous, or non porous multi-components or semi conductive or dielectric combinations to the flowing liquid jet stream proportionately so as to form radical species or for photolytic, or photo catalytically triggering or for directly photo chemically effecting disinfecting, or sterilizing, dissociating, mineralizing or oxidizing, cleaning or decontaminating said liquid or gases or surfaces or combination in a single simultaneous action within a predetermined period of time.

5. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, wherein the photochemical treatment is disinfecting of the liquid jet and wherein the target site is a packaging material for containing the liquid, allowing for aseptic filling of mineral water, flavored water,

beverages and medical preparation into packaging materials such as a bottle, a jug or conduit or chamber type packaging.

6. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, comprising; inserting or coupling a light source having at least one high intensity UV pulsed laser light beam into a hollow aerobic conduit; Pumping a predetermined volume of water or gasses or combinations having a higher refractive index around 1.3, or N1 then the air or gas surrounding the flowing liquid stream at around 1.00, or N2 thus creating a refractive index profile N1+N2 which guide, deliver, and spatially process light therein, and throughout by total internal reflection; delivering said liquids, and gases to a separate hydro-optical inlet or input positioned further along the hollow conduit, at a predetermined pressure threshold sufficient for the formation of venturi pressure to form at the coupling laser input thus eliminating the need for solid state optical grade elements or lenses eliminating damage threshold limitations; Adding or subtracting a predetermined oxygen concentration, singlet oxygen, predetermined particle size of photo catalysts nano particles alkali or catalytic species, or H2O2, or TiO2, or ZdnO3, or combination to the generally flowing liquid stream premixed, or inserted through a predetermined biocompatible needle, or static mixer so as to form radical species or for photolytic, or photo catalytic triggering when interacting with the guided pulsed UV laser light therein, or for directly disinfecting, or sterilizing; washing, and exposing, disinfecting, sterilizing, and inactivating noxious species in a simultaneous, sequential, serial or parallel array of UVJET action over a predetermined surface area or volume, within a predetermined period of time wherein dose of said pulses is being calibrated against specie specific calibration standards for sterilization, disinfection, oxidation, mineralization, decontamination and electro-photochemical treatment of noxious species turning said species into more innocuous more manageable forms.

7. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, comprising; inserting or coupling a light source or pulsed laser having high intensity UVA, UVB, UVC pulsed laser light beam into a hollow aerobic conduit; Pumping a predetermined volume of water or gasses or combinations having a higher refractive index around 1.3 then the air or gas surrounding the flowing liquid stream at around 1.00 thus creating a refractive index profile which guide, deliver, and spatially process light therein, and throughout; delivering said liquids, and gases to a separate hydro-optical inlet or input positioned further along the hollow conduit, at a predetermined pressure threshold sufficient for the formation of venturi pressure to form at the coupling laser input eliminating the need for solid state optical grade elements or lenses; Adding or subtracting a predetermined oxygen concentration or catalytic species, or H2O2, OR tlo2, or O3, or combination to the generally flowing liquid stream premixed, or inserted through a predetermined needle, or static mixer so as to form radical species or for photolytic, or photo catalytic triggering when interacting with the guided pulsed UV

laser light therein, or for directly disinfecting, or sterilizing; washing, and exposing, disinfecting, sterilizing, and inactivating noxious species, or for reducing the concentration of TOCs, or VOCs in a simultaneous action over a predetermined surface area or volume, within a predetermined period of time.

8. Method for guiding high intensity light in a UVJET flowing liquid wave guide, comprising; inserting or coupling a light source or pulsed laser having high intensity UVA, UVB, UVC pulsed laser light beam into a hollow aerobic conduit; Pumping a predetermined volume of water or gasses or combinations having a higher refractive index around 1.3 then the air or gas surrounding the flowing liquid stream at around 1.00 thus creating a refractive index profile which guide, deliver, and spatially process light therein, and throughout; delivering said liquids, and gases to a separate hydro-optical inlet or input positioned further along the hollow conduit, at a predetermined pressure threshold sufficient for the formation of venturi pressure to form at the coupling laser input eliminating the need for solid state optical grade elements or lenses; Adding or subtracting a predetermined oxygen concentration or catalytic species, or H2O2, OR tlo2, or O3, or combination to the generally flowing liquid stream premixed, or inserted through a predetermined needle, or static mixer so as to form radical species or for photolytic, or photo catalytic triggering when interacting with the guided pulsed UV laser light therein, or for directly disinfecting, or sterilizing; washing, and exposing, disinfecting, sterilizing, and inactivating noxious species, or for reducing the concentration of TOCs, or VOCs in a single simultaneous action over a predetermined surface area or volume, within a predetermined period of time for efficient treatment of the flowing water, air, liquids, and gases.

9. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, comprising: at least one laser, or high intensity pulsed, or continuous, or hybrid combination of light sources wherein said light from the light sources is coupled to the real time flowing liquid waveguide for filling and simultaneously washing and disinfection, sterilization, and inactivation, dissociation, and triggering of catalytic, and photo catalytic photo induced chemical reactions beneficial for the cleaning, decontamination or disinfection of mineral water, flavored water and agro-food produce such as containers, bottles, five gallons return lines, and wherein at least one of said light sources is operating at a preferred mode for industrial operation wherein pulse repetition frequencies is from about 1 Hz, to about 1 THz, having wavelength from about 266nm to about 400nm, and wherein energy per pulse is between about 1mJ to about 15Js, and wherein pulse width is between 1 Ato second to about 0.5 microsecond and wherein the fluence rate or photon flow is sufficient for performing Multiphoton absorption processes maximizing efficiencies of photo damage to noxious species such as bacteria and viruses while said fluence rate or photon flow or intensity is insufficient to perform molecular migration to liquid packaging being filled, or to

predetermined surface area being treated. .

10. A device for the production of a UVJET according to the methodology of the present invention using the method of the present invention according to claim 1, comprising: at least one laser, or high intensity light source operatively utilized at pulse repetition frequencies from about 1 Hz, to about 1 THz, and a wavelength from about 200 nm, to about 1100nm, and wherein appropriate selection of wavelength and repetition rate, pulse width and average energy formulate dosimeter value adequate for decontamination, sterilization or aseptic filling and simultaneously washing of packed water, production nozzles, and working surface areas.

11. A device for the production of a UVJET for NBC cleaning applications of human skin, work surfaces, and selected metropolitan areas and for decontamination according to claim one of the methodology of the present invention, comprising: A real time flowing liquid waveguide for delivery of water based suspension within the liquid light guide jet stream, and wherein said jet stream contains at least one oxidizer, or singlet oxygen, H2O2, TiO2, or at least one photo catalyst, or photosensitive component, or predetermined concentration of alkali or fluorescent components for optical marking of treated areas, or for monitoring treated areas visually and for effective swift decontamination, sterilization, advanced oxidation and mineralization of noxious species of biological or chemical origin on a single technological platform.

12. A device using the method of the present invention according to claim 1, comprising: at least one laser, or high intensity light source is projecting its beam of light directly, or through waveguides to the opening of water projection means and wherein the resulting jet stream is aimed and directionally position to sterilize and simultaneously wash and decontaminate surface of instrument, tools, or wounds, or burns on human or animal skin, or plants for decontamination of plants from pesticides and noxious species.

13. A device using the method of the present invention according to claim 1, comprising: at least one laser, or high intensity light source is projecting its beam of light directly, or through waveguides to the opening of water projection means and wherein the resulting jet stream liquid light guide is aimed and directionally position to aseptically fill and simultaneously sterilize and wash and decontaminate the inner surface of packaged water such as bottles and jugs and wherein the inner surface of said bottles or jugs is being disinfected or decontaminated during said aseptic filling procedures.

14. A device using the method of the present invention according to claim 1, wherein the UVJET is biocompatible or photo catalytically coated with metal oxide, or with thin film or layer of immobilized semi-conductor, dielectric, or super- conductive particles and wherein said photo catalytic particles size is selected from about micron size top about nano particle size and wherein said particles properties are calibrated to the photo

catalytic effect needed to ensure no bio-film and bacteria compounding volumes may accumulate on said inner surfaces.

15. A device using the method of the present invention according to claim 1, comprising: the preferred mode for the packaging being penetrated is made out of PET, or polyolefin, or polyamide, or polycarbonate, or polyester amide, or polyester or any resin combination thereof having refractive index profile for partial, or total internal reflection therein driving the UVJET for disinfection, or equalization of the concentration of contaminants, or noxious species therein, i.e. in the packaging containing the predetermined volume of liquids, or gas therein.

16. A device using the method of the present invention as claimed in claims 4-9 wherein at least one Nd:Yag laser is operating at THG, third harmonic generation as preferred mode for the production of at least one pulse of light having wavelength of 355nm driving the UVJET, and wherein each time duration of said pulses of light is from about 1s, to about 1 fs, and wherein repetition rates of said laser light source is from about 1 Hz to about 1 THz for the preferred mode of triggering catalytic reaction, and or disinfection or sterilization of surface or dimension.

17. A device using the method of the present invention according to claim 1, wherein the polymers selected for treating or filling packaged water are Polyolefin, polyamide, polycarbonate, polyester amide, polyester resin combination thereof, or terephtalate (PET), Polybutylen terephtalate (PBT), polyalkyl terephtalate, polyethylene naphtalate (PEN), polyalkyl naphtalate (PETG) .

18. A device using the method of the present invention according to claim 1, where, in the cork or lid or bottom of the packaging, or any layer in the packaging is made out of from Polyolefin, polyamide, polycarbonate, polyesteramide, polyester resin combination thereof, or terephtalate (PET), Polybutylen terephtalate (PBT), polyalkyl terephtalate, polyethylen naphtalate (PEN), polyalkyl naphtalate (PETG), PET/PEN, PET/nylon, PET/Evoh, PET/Evoh copolymer or blend with ethylen-meth) acrylic acid, or combination with ultrapure water based catalytic compound having adequate refractive index profile therein for guiding light throughout. Especially beneficial for disinfection through the multi textural, multiple curvatures surface of medical instruments, tools, and engineering, and biotechnological devices having loaded working cycle.

19. A device using the method of the present invention according to claim 1, comprising: A method for surface treatment and for sterilization using modular, structurally yielding Oxygen Charged (SYOC) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light and all optronic delivery and triggering devices for dimensional use thereof

20. A device using the method of the present invention according to claim 1, wherein the preferred mode for sterilizing dental accessories, tools and medical instrumentation, comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional use thereof.

21. A device using the method of the present invention according to claim 1, wherein the preferred mode for sterilizing tools accessories, and instrumentation used in veterinary medical treatment procedures comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional use thereof.

22. A device using the method of the present invention according to claim 1, wherein the preferred mode for sterilizing tools accessories, and instrumentation used in emergency & field medical treatment procedures comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional use thereof.

23. A device using the method of the present invention according to claim 1, wherein the preferred mode for sterilizing tools accessories, and instrumentation used in medical engineering involved in medical treatment procedures comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a

predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional use thereof.

24. A device using the method of the present invention according to claim 1, wherein the preferred mode for sterilizing tools accessories, and instrumentation used in emergency & field medical treatment procedures comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional use thereof.

25. A device according to the method of the present invention according to claim 1, wherein the preferred mode for sterilizing tools accessories, and instrumentation used in small local autoclaving, or large central disinfection chambers for Surgical instrumentation of medical treatment procedures comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional use thereof.

26. A device using the method of the present invention according to claim 1, wherein the preferred mode for sterilizing tools accessories, and instrumentation used from Surgical instrumentation kits, autoclaving, emergency & field, medical engineering, veterinary, dental, wherein the preferred mode according to the specific applications preferred mode of operation will necessitate integration or assimilation of the laser light source to be selected from (a) Gas discharge laser, (b) diode pumped lasers, (c) plasma discharged lasers, (d) solid state lasers, (e) semi conductor lasers, (f) crystal type of lasers, (g), X-rays pumped lasers, (h) E-beam pumped gas lasers types, FEL (Free Electron Laser amplifier), (j) EA/FEL (Electrostatically Accelerated Free Electron Laser), or organic laser types or any combination thereof for providing the necessary photons at the appropriate wavelength, tuning energy or energy density required for triggering and acousto-optic utilization.

27. A device using the method of the present invention according to claim 1, wherein the preferred mode for sterilizing tools accessories, and instrumentation used in cosmetics,

plastic surgery from medical treatment procedures comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional acousto-optic utilization thereof.

28. A device using the method of the present invention according to claim 1, wherein the preferred mode for sterilizing tools accessories, and instrumentation used in alternative medicine or alternative medical treatment procedures comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional acousto-optic utilization thereof.

29. A device using the method of the present invention according to claim one wherein the preferred mode for sterilizing tools accessories, and instrumentation used in aqua puncture or aqua pressure medical treatment procedures comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional acousto-optic utilization thereof.

30. A device using the method of the present invention according to claim one wherein the preferred mode for sterilizing tools accessories, and instrumentation used in gynecological medical treatment procedures comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration,

CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional acousto-optic utilization thereof.

31. A device using the method of the present invention according to claim one wherein the preferred mode for sterilizing tools accessories, and instrumentation used in angioplasty medical treatment procedures comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional acousto-optic utilization thereof.

32. A device using the method of the present invention according to claim one wherein the preferred mode for sterilizing tools accessories, and instrumentation used in cardiac vascular medical treatment procedures comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional acousto-optic utilization thereof.

33. A device using the method of the present invention according to claim one wherein the preferred mode for sterilizing tools accessories, and instrumentation used in dermatological medical treatment procedures comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional acousto-optic utilization thereof.

34. A device using the method of the present invention according to claim one wherein the preferred mode for sterilizing tools accessories, and instrumentation used in PDT medical treatment procedures comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles

expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional acousto-optic utilization thereof.

35. A device using the method of the present invention according to claim one wherein the preferred mode for sterilizing tools accessories, and instrumentation used in periodontal medical treatment procedures comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional acousto-optic utilization thereof.

36. A device using the method of the present invention according to claim one wherein the preferred mode for sterilizing tools accessories, and instrumentation used in cancer medical treatment procedures comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional acousto-optic utilization thereof.

37. A device using the method of the present invention according to claim one wherein the preferred mode for sterilizing tools accessories, and instrumentation used in allergenic medical treatment procedures comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional acousto-optic utilization thereof.

38. A device using the method of the present invention a according to claim one wherein the preferred mode for sterilizing tools accessories, and instrumentation used in geriatric medical treatment procedures comprising: Triggering surface treatment and or

sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional acousto-optic utilization thereof.

39. A device using the method of the present invention according to claim one wherein the preferred mode for sterilizing tools accessories, and instrumentation used in children medical treatment procedures comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional acousto-optic utilization thereof.

40. A device using the method of the present invention according to claim one wherein the preferred mode for sterilizing tools accessories, and instrumentation used in general operation theater medical treatment procedures comprising; Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional acousto-optic utilization thereof.

41. A device using the method of the present invention according to claim one wherein the preferred mode for sterilizing tools accessories, and instrumentation used in treating burns, and cuts, sores, and pressure wounds eventualities in medical treatment procedures comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional acousto-optic utilization thereof.

42. A device using the method of the present invention according to claim one wherein the preferred mode for sterilizing tools accessories, and instrumentation used in transplant medical procedures comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional acousto-optic utilization thereof.

43. A device using the method of the present invention according to claim one wherein the preferred mode for sterilizing tools accessories, and instrumentation used in dialysis medical treatment procedures comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional acousto-optic utilization thereof.

44. A device using the method of the present invention according to claim one wherein the preferred mode for sterilizing tools accessories, and instrumentation used in eye surgery or medical treatment procedures comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional acousto-optic utilization thereof.

45. A device using the method of the present invention according to claim one wherein the preferred mode for sterilizing tools accessories, and instrumentation used in administrating anathstetics during plurality of medical treatment procedures comprising: driving the UVJET for Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to

manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional acousto-optic utilization thereof.

46. A device using the method of the present invention according to claim one wherein the preferred mode for sterilizing tools accessories, and instrumentation used in physiotherapy treatment procedures comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses driving the UVJET synched for dimensional acousto-optic utilization thereof.

47. A device using the method of the present invention according to claim one wherein the preferred mode for sterilizing tools accessories, and instrumentation used in toxicology or decontamination of medical treatment procedures areas comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional acousto-optic utilization thereof.

48. A device using the method of the present invention according to claim one wherein the preferred mode for sterilizing tools accessories, and instrumentation used in nose ear, and throat doctors administrating medical treatment procedures comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional acousto-optic utilization thereof.

49. A device using the method of the present invention according to claim one wherein the preferred mode for sterilizing tools accessories, and instrumentation used in brain surgery

medical treatment procedures comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional acousto-optic utilization thereof.

50. A device using the method of the present invention according to claim one wherein the preferred mode for sterilizing tools accessories, and instrumentation used in ultrasound medical treatment and diagnostics procedures comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional acousto-optic utilization thereof.

51. A device using the method of the present invention according to claim one wherein the preferred mode for sterilizing tools accessories, and instrumentation used in endoscope medical diagnostic treatment procedures comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional acousto-optic utilization thereof.

52. A device using the method of the present invention according to claim one wherein the preferred mode for sterilizing tools accessories, and instrumentation used in stenting or angioplasty medical treatment procedures comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional acousto-optic utilization thereof.

53. A device using the method of the present invention according to claim one wherein the preferred mode for sterilizing tools accessories, and instrumentation used in first aid medical treatment procedures comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional acousto-optic utilization thereof.

54. A device using the method of the present invention according to claim one wherein the preferred mode for sterilizing tools accessories, and instrumentation used in respiratory medical treatment procedures comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional acousto-optic utilization thereof.

55. A device using the method of the present invention according to claim one wherein the preferred mode for sterilizing tools accessories, and instrumentation used in medical treatment procedures for food poisoning comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional acousto-optic utilization thereof.

56. A device using the method of the present invention according to claim one wherein the preferred mode for sterilizing tools accessories, and instrumentation used in blood transfusion and processing during medical treatment procedures comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a

predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional acousto-optic utilization thereof.

57. A device using the method of the present invention according to claim one wherein the preferred mode for sterilizing tools accessories, and instrumentation used in manicure, and pedicure cosmetic treatment procedures comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional acousto-optic utilization thereof.

58. A device using the method of the present invention according to claim one wherein the preferred mode for sterilizing tools accessories, and instrumentation used in cleaning ships, plains, or vehicles treatment procedures comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional acousto-optic utilization thereof.

59. A device using the method of the present invention according to claim one wherein the preferred mode for sterilizing tools accessories, and instrumentation used in cleaning traceable air pollution comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles, or bubbles comprising liquids, and gases expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional acousto-optic utilization thereof.

60. A device using the method of the present invention according to claim one wherein the preferred mode for sterilizing tools accessories, and instrumentation used in domestic cleaning, in locations, such as sanitary support means, sinks, ovens, fridges, microwave ovens, heaters, coolers, support means, cupboards, tiles, floor, ceilings, medical

treatment procedures comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional acousto-optic utilization thereof.

61. A device using the method of the present invention according to claim one wherein the preferred mode for sterilizing tools accessories, and instrumentation used in cleaning rubbish dumps comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional acousto-optic utilization thereof.

62. A device using the method of the present invention according to claim one wherein the preferred mode for sterilizing tools accessories, and instrumentation used in cleaning chips in electronic industries treatment procedures comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional acousto-optic utilization thereof.

63. A device using the method of the present invention according to claim one wherein the preferred mode for sterilizing tools accessories, and instrumentation used in optical washing machines applying catalytic treatment procedures to fabrics comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein

Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional acousto-optic utilization thereof.

64. A device using the method of the present invention according to claim one wherein the preferred mode for sterilizing tools accessories, and instrumentation used in food and beverage treatment production, and packaging procedures on sites comprising: Triggering surface treatment and or sterilization using modular, structurally yielding Oxygen Charged (SYOCH) U.P.W, PH stabilized, carbomer variable photo-catalytic-water or air suspension, suspended polymeric plurality particles expanded coated and calibrated to be mobilized by pulsed UVA/UVB/UVC laser light reducing the level of toxic noxious species below concentration, CFU, or danger threshold to manageable levels within a predetermined space over a predetermined period of time, and wherein Activating on all peak power optronic delivery and triggering apparatuses synched for dimensional acousto-optic utilization thereof.

65. A device using the methodology of the present invention for effecting internal blood and bodily fluids without effecting external surface of body non invasive, according to any of the preceding claims comprising: calibrating semi opaque Opto-mechanical properties of skin, and/or said catalytic compound of the present invention for predetermined absorption band, or action spectrum, density, or predetermined refractive index, or refractive profile throughout for coupling or converting light or sound to and from predetermined destination, and for enhancing the coupling efficiency, and absorption spectrum of the blood flow therein;innitiating acoustic optronic, or electronic diagnostic procedures, or objective using at least one tool or instrument; activating at least one radiation unit or interface directly, or continuously, in recurrently, or cyclically, or non recurrently mode involving at least one high intensity source of light, or pulsed Vis, UVA, UVB laser and wherein light from the laser is aligned to the end of at least one optical fiber, or wave-guide, or photogenic band gap, or aerobic or liquid wave-guide, or tapered guide or integrated arm, and wherein from other side of optical fiber, or bundle of fibers, or wave guide, or photonic band gap, or liquid light guide, or any combination thereof delivering light to/from external surface of body, or directly illuminating or irradiating within said interface, the surface of the outer body in a predetermined energy density, cumulative dose response curve, over a predetermined surface area, over a predetermined period of time or duty cycle.

66. A device using the methodology of the present invention for effecting internal blood and bodily fluids without effecting external surface of body (non invasive), according to any of the preceding claims comprising: Compounding a predetermined volume of ultra-pure-water-based multi component system containing at least one liquid or gas or carbomer, or bonding agent, or -catalytic-compound, PH stabilizers suspended, or expanded to contain at least one semi conductor, or catalytically potent or photo reactive

components, or TIO2 photo-catalyst, or chemical precursor, or chemical biocompatible marker or colorimetric component having a predetermined acoustic coupling density, or resonance potential; Calibrating semi opaque Opto-mechanical properties of said catalytic compound for predetermined absorption band, or action spectrum, density, or predetermined refractive index, or refractive profile throughout for coupling or converting light or sound to and from predetermined destination, and for enhancing the coupling efficiency, and absorption spectrum of the blood flow therein;Innitiating acoustic optronic, or electronic diagnostic procedures, or objective using at least one tool or instrument which needs to be disinfected or made safe, or made biocompatible free of noxious or infectious predetermined specie component, in a predetermined multi-component environment or threatening antigen, or wherein incoming infectious events may cause health concern as a result of surface penetration or transmission through of noxious species, or wherein blood flow therein body contain noxious species concentration above threshold for safety risking health; delivering separately photo reactive, or catalytically potent compound whipping, or spraying, applying or delivering, infusing inserting, injecting, or activating intake of catalytic compound pre, or post exposure to pulsed light of UVA, laser or medical engineering procedures ;inserting or attaching said medical instruments, or device, or optically charged delivery tool into a predetermined receptive interface or conduit or chamber type geometry on the outer surface of the body having a predetermined volume, and manageable boundaries Opto-mechanically permeable to wavelength from about 350nm to about 999nm in the effective wavelength range appropriate; Activating at least one radiation unit or interface directly, or continuously, in recurrently, or cyclically, or non recurrently mode involving at least one high intensity source of light, or pulsed Vis, UVA, UVB laser and wherein light from the laser is aligned to the end of at least one optical fiber, or wave-guide, or photogenic band gap, or aerobic or liquid wave-guide, or tapered guide or integrated arm, and wherein from other side of optical fiber, or bundle of fibers, or wave guide, or photonic band gap, or liquid light guide, or any combination thereof delivering light to/from external surface of body, or directly illuminating or irradiating within said interface, the surface of the outer body in a predetermined energy density, cumulative dose response curve, over a predetermined surface area, over a predetermined period of time or duty cycle.

67. A device using the methodology of the present invention for effecting internal blood and bodily fluids without effecting external surface of body (non invasive), according to claim one comprising: Attaching optical waveguides, and diffusing elements to predetermined location externally to the human or animal body; Activating at least one radiation unit having high intensity source of monochromatic light at about 355nm to about 999nm, at energy densities from 0.001mW/Cm2, to about 200mW/Cm2; exposing synchronously different part of the external relatively exposed blood vessels, such as found in areas selected from head, legs, hands, wrists, feets, neck, forehead, stomach, belly, rectum, or any combination thereof to energy from said light source over a

predetermined surface area, over a predetermined period of time thus reducing the population of noxious species in the blood therein without damaging external, or internal blood or physiological components.

68. A device using the methodology of the present invention for effecting internal blood and bodily fluids without effecting external surface of body (non invasive), according to claim one comprising: Attaching optical waveguides, and diffusing elements to predetermined location externally to the human or animal body; Activating at least one radiation unit having high intensity source of monochromatic light at about 355nm to about 999nm, at energy densities from 0.001mW/Cm2, to about 200mW/Cm2; exposing synchronously different part of the external relatively exposed blood vessels, such as found in areas selected from head, legs, hands, wrists, feets, neck, forehead, stomach, belly, rectum, or any combination thereof to energy from said light source over a predetermined surface area, over a predetermined period of time thus reducing the population of noxious species in the blood therein without damaging external, or internal blood or physiological components thus facilitating non invasive disinfection of internally flowing blood components.

69. A method and device using the methodology of the present invention for sterilizing and disinfecting the surface of medical instrumentation, according to claim one, comprising: Preferred mode of utilization for dentistry, general dentists, periodentists, orthodontists, pedodentists, pediatric dentists, pedodentists, oral/maxillofacial surgeons, and orthodontists wherein the duty cycle of procedures thus performed in these respective field are shortened, and time and resources saved, effectively reducing the population of noxious species, thus increasing the level of health, and therapeutic applications of devices according to the methodology of the present invention.

70. A method and device using the methodology of the present invention for sterilizing and disinfecting the surface of medical instrumentation, according to claim one, comprising: Preferred mode of utilization for dentistry, general dentists, periodentists, orthodontists, pedodentists, pediatric dentists, pedodentists, oral/maxillofacial surgeons, and orthodontists wherein the duty cycle of procedures thus performed in these respective field when using multi component catalytic U.PW based compound or coupling gel, spray, or liquid or gas facilitating the shortening, and time and resources saving, as results of effectively reduction of the population of noxious species on surface or volume, within predetermined area or dimension, thus increasing the level of health, and therapeutic applications of devices according to the methodology of the present invention.

71. A method and device using the methodology of the present invention for sterilizing and disinfecting the surface of medical instrumentation, according to claim one, comprising the light which provide the triggering signal is produced by flush lamps, UVA, UVB, UVC laser pumped by diodes bar arrays, flush lamp pumped Nd;Yag lasers, sub microsecond

lasers, gas discharge lasers, hybrid of CW/PW integration, X-ray pumped lasers, E-beam pumped lasers, FEL, AEFEL lasers, and semi conductor lasers, or space charged excitation charged lasers or any combination thereof for the delivery of static, stable, or cumilative dose made out of a plurality of micro, or macro pulses from 1 photon per second to about 100 Billion Photons per second, at repetition rates from about 1 Hz, to about 10 THz, at wavelength from about 355nm to about 999nm, and wherein acusto-optical-interaction are thus been facilitated as result of translational relationships between acoustics, electronic, and optics causing resonance useful to determined optical masking od certain molecules while making other molecules in proximity more susceptible for predetermined specie specific action spectrum, thus inactivating specie specific calibration standards using the acusto-optronic interaction using the methodology of the present invention.

72. A method and device using the methodology of the present invention for sterilizing and disinfecting the surface of medical instrumentation, according to claim one, comprising the beam is delivered directly on to the surface of the instrument or tool, or the beam is coupled to the end of a waveguide interface or integrated arm for remote delivery of the appropriate energy levels to the destination, and wherein such bundle formation, harness, or multi split level optical waveguide is adjusted as to illuminator irradiate the surface area at the appropriate energy density levels require for implementing at least one biodosimetric curve against at least one noxious specie which causes health concern and can be found in high population concentration.

73. A method and device using the methodology of the present invention for sterilizing and disinfecting the surface of medical instrumentation, according to claim one, comprising: Preferred mode of utilization for emergency medicine requiring fast responses to incoming or inflicted infectious events wherein the duty cycle of procedures thus performed in these respective field when using multi component catalytic U.PW based compound or coupling gel, spray, or liquid or gas facilitating the shortening, and time and resources saving, as results of effectively reduction of the population of noxious species on surface or volume, within predetermined area or dimension, thus increasing the level of health, and therapeutic applications of devices according to the methodology of the present invention facilitating safe sterilized surface area on tools, or body external surface.

74. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, comprising; utilization for anesthesiology wherein the duty cycle of procedures thus performed in these respective field when using multi component catalytic U.PW based compound or directly coupling pulsed UVA, UVB, UVC laser light directly, or in combination with/to gel, spray, or liquid or gas facilitating the shortening, and time and resources saving, as results of effectively reduction of the

population of noxious species on surface or volume, within predetermined area or dimension, thus increasing the level of health, and therapeutic applications of devices according to the methodology of the present invention.

75. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, comprising; utilization for dermatology wherein the duty cycle of procedures thus performed in these respective field when using multi component catalytic U.PW based compound or directly coupling pulsed UVA, UVB, UVC laser light directly, or in combination with/to gel, spray, or liquid or gas facilitating the shortening, and time and resources saving, as results of effectively reduction of the population of noxious species on surface or volume, within predetermined area or dimension, thus increasing the level of health, and therapeutic applications of devices according to the methodology of the present invention.

76. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, comprising; utilization for gastroenterology wherein the duty cycle of procedures thus performed in these respective field when using multi component catalytic U.PW based compound or directly coupling pulsed UVA, UVB, UVC laser light directly, or in combination with/to gel, spray, or liquid or gas facilitating the shortening, and time and resources saving, as results of effectively reduction of the population of noxious species on surface or volume, within predetermined area or dimension, thus increasing the level of health, and therapeutic applications of devices according to the methodology of the present invention.

77. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, comprising; utilization for Ob-Gyn wherein the duty cycle of procedures thus performed in these respective field when using multi component catalytic U.PW based compound or directly coupling pulsed UVA, UVB, UVC laser light directly, or in combination with/to gel, spray, or liquid or gas facilitating the shortening, and time and resources saving, as results of effectively reduction of the population of noxious species on surface or volume, within predetermined area or dimension, thus increasing the level of health, and therapeutic applications of devices according to the methodology of the present invention.

78. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, comprising; utilization for oncology wherein the duty cycle of procedures thus performed in these respective field when using multi component catalytic U.PW based compound or directly coupling pulsed UVA, UVB, UVC laser light directly, or in combination with/to gel, spray, or liquid or gas facilitating the shortening, and time and resources saving, as results of effectively reduction of the population of noxious species on surface or volume, within predetermined area or dimension, thus increasing the level of health, and therapeutic applications of devices

according to the methodology of the present invention.

79. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, comprising; utilization for ophthalmology wherein the duty cycle of procedures thus performed in these respective field when using multi component catalytic U.PW based compound or directly coupling pulsed UVA, UVB, UVC laser light directly, or in combination with/to gel, spray, or liquid or gas facilitating the shortening, and time and resources saving, as results of effectively reduction of the population of noxious species on surface or volume, within predetermined area or dimension, thus increasing the level of health, and therapeutic applications of devices according to the methodology of the present invention.

80. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, comprising; utilization for osteopathy wherein the duty cycle of procedures thus performed in these respective field when using multi component catalytic U.PW based compound or directly coupling pulsed UVA, UVB, UVC laser light directly, or in combination with/to gel, spray, or liquid or gas facilitating the shortening, and time and resources saving, as results of effectively reduction of the population of noxious species on surface or volume, within predetermined area or dimension, thus increasing the level of health, and therapeutic applications of devices according to the methodology of the present invention.

81. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, comprising; utilization for pain management wherein the duty cycle of procedures thus performed in these respective field when using multi component catalytic U.PW based compound or directly coupling pulsed UVA, UVB, UVC laser light directly, or in combination with/to gel, spray, or liquid or gas facilitating the shortening, and time and resources saving, as results of effectively reduction of the population of noxious species on surface or volume, within predetermined area or dimension, thus increasing the level of health, and therapeutic applications of devices according to the methodology of the present invention.

82. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, comprising; utilization for pathology wherein the duty cycle of procedures thus performed in these respective field when using multi component catalytic U.PW based compound or directly coupling pulsed UVA, UVB, UVC laser light directly, or in combination with/to gel, spray, or liquid or gas facilitating the shortening, and time and resources saving, as results of effectively reduction of the population of noxious species on surface or volume, within predetermined area or dimension, thus increasing the level of health, and therapeutic applications of devices according to the methodology of the present invention.

83. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, comprising; utilization for pediatrics wherein the duty cycle of procedures thus performed in these respective field when using multi component catalytic U.PW based compound or directly coupling pulsed UVA, UVB, UVC laser light directly, or in combination with/to gel, spray, or liquid or gas facilitating the shortening, and time and resources saving, as results of effectively reduction of the population of noxious species on surface or volume, within predetermined area or dimension, thus increasing the level of health, and therapeutic applications of devices according to the methodology of the present invention.

84. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, comprising; utilization for podiatry wherein the duty cycle of procedures thus performed in these respective field when using multi component catalytic U.PW based compound or directly coupling pulsed UVA, UVB, UVC laser light directly, or in combination with/to gel, spray, or liquid or gas facilitating the shortening, and time and resources saving, as results of effectively reduction of the population of noxious species on surface or volume, within predetermined area or dimension, thus increasing the level of health, and therapeutic applications of devices according to the methodology of the present invention.

85. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, comprising; utilization for radiology wherein the duty cycle of procedures thus performed in these respective field when using multi component catalytic U.PW based compound or directly coupling pulsed UVA, UVB, UVC laser light directly, or in combination with/to gel, spray, or liquid or gas facilitating the shortening, and time and resources saving, as results of effectively reduction of the population of noxious species on surface or volume, within predetermined area or dimension, thus increasing the level of health, and therapeutic applications of devices according to the methodology of the present invention.

86. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, comprising; utilization for cardiothoracic surgery wherein the duty cycle of procedures thus performed in these respective field when using multi component catalytic U.PW based compound or directly coupling pulsed UVA, UVB, UVC laser light directly, or in combination with/to gel, spray, or liquid or gas facilitating the shortening, and time and resources saving, as results of effectively reduction of the population of noxious species on surface or volume, within predetermined area or dimension, thus increasing the level of health, and therapeutic applications of devices according to the methodology of the present invention.

87. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, comprising; utilization for cardiology and invasive

diagnostic and treatment procedures wherein the duty cycle of said procedures thus performed in these respective field when using multi component catalytic U.PW based compound or directly coupling pulsed UVA, UVB, UVC laser light directly, or in combination with/to gel, spray, or liquid or gas facilitating the shortening, and time and resources saving, as results of effectively reduction of the population of noxious species on surface or volume, within predetermined area or dimension, thus increasing the level of health, and therapeutic applications of devices according to the methodology of the present invention.

88. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, comprising; utilization for cosmetics, and plastic surgery wherein the duty cycle of procedures thus performed in these respective field when using multi component catalytic U.PW based compound or directly coupling pulsed UVA, UVB, UVC laser light directly, or in combination with/to gel, spray, or liquid or gas facilitating the shortening, and time and resources saving, as results of effectively reduction of the population of noxious species on surface or volume, within predetermined area or dimension, thus increasing the level of health, and therapeutic applications of devices according to the methodology of the present invention.

89. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, comprising; utilization for orthopedics wherein the duty cycle of procedures thus performed in these respective field when using multi component catalytic U.PW based compound or directly coupling pulsed UVA, UVB, UVC laser light directly, or in combination with/to gel, spray, or liquid or gas facilitating the shortening, and time and resources saving, as results of effectively reduction of the population of noxious species on surface or volume, within predetermined area or dimension, thus increasing the level of health, and therapeutic applications of devices according to the methodology of the present invention.

90. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, comprising; utilization for ENT wherein the duty cycle of procedures thus performed in these respective field are reduced when using through the flowing liquid waveguide at least one multi component catalytic U.PW based compound or directly coupling pulsed UVA, UVB, UVC laser light, or in combination with/to gel, spray, or liquid or gas facilitating the shortening, and time and resources saving, as results of effectively reduction of the population of noxious species on surface or volume, within predetermined area or dimension treated by the UVJET, thus increasing the level of health, and therapeutic applications of devices according to the methodology of the present invention.

91. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, comprising; utilization for general surgery in wide

diversified medical fields wherein the duty cycle of procedures thus performed in these respective field when using multi component catalytic U.PW based compound or directly coupling pulsed UVA, UVB, UVC laser light directly, or in combination with/to gel, spray, or liquid or gas facilitating the shortening, and time and resources saving, as results of effectively reduction of the population of noxious species on surface or volume, within predetermined area or dimension, thus increasing the level of health, and therapeutic applications of devices according to the methodology of the present invention.

92. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, comprising; utilization for endoscope surgery/procedures wherein the duty cycle of procedures thus performed in these respective field when using multi component catalytic U.PW based compound or directly coupling pulsed UVA, UVB, UVC laser light directly, or in combination with/to gel, spray, or liquid or gas facilitating the shortening, and time and resources saving, as results of effectively reduction of the population of noxious species on surface or volume, within predetermined area or dimension, thus increasing the level of health, and therapeutic applications of devices according to the methodology of the present invention.

93. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, comprising; utilization for skin treatment, ear disorders, eye disorders, mouth disorders, throat disorders, dental disorders wherein the duty cycle of procedures thus performed in these respective field when using multi component catalytic U.PW based compound or directly coupling pulsed UVA, UVB, UVC laser light directly, or in combination with/to gel, spray, or liquid or gas facilitating the shortening, and time and resources saving, as results of effectively reduction of the population of noxious species on surface or volume, within predetermined area or dimension, thus increasing the level of health, and therapeutic applications of devices according to the methodology of the present invention.

94. A method for sterilizing and disinfecting the surface of medical instrumentation, according to claim one, comprising: Preferred mode of utilization for external non invasive treatment by light at high energy density wherein the duty cycle of procedures thus performed in these respective field when using multi component catalytic U.PW based compound or directly coupling pulsed UVA, UVB, UVC laser light directly, or in combination with/to gel, spray, or liquid or gas facilitating the shortening, and time and resources saving, as results of effectively reduction of the population of noxious species on surface or volume, within predetermined area or dimension, thus increasing the level of health, and therapeutic applications of devices according to the methodology of the present invention.

95. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, comprising; utilization for domestic cleaning and

disinfection, and sterilization of apparatuses selected from kitchens, sinks, bathrooms, infrastructural support means, floors, ceilings, air wherein the duty cycle of procedures thus performed in these respective field or domestic environment using multi component catalytic U.PW based compound or directly coupling pulsed UVA, UVB, UVC laser light directly, or in combination with gel, spray, or liquid or gas facilitating the shortening, and time and resources saving, as results of effectively reduction of the population of noxious species on surface or volume, within predetermined area or dimension, thus increasing the level of health, and hygiene applications of devices according to the methodology of the present invention.

96. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, comprising: utilization for domestic cleaning and disinfection, and sterilization of apparatuses selected from kitchens, sinks, bathrooms, infrastructural support means, floors, ceilings, air enhancing super hydrophelicity wherein the duty cycle of procedures thus performed in these respective field or domestic environment using multicomponent catalytic U.PW based compound or directly coupling pulsed UVA, UVB, UVC laser light directly, or in combination with gel, spray, or liquid or gas facilitating the shortening, and time and resources saving, as results of effectively reduction of the population of noxious species on surface or volume, within predetermined area or dimension, thus increasing the level of health, and hygiene applications of devices according to the methodology of the present invention.

97. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, comprising; utilization for dentistry, general dentists, periodentists, orthodontists, pedodentists, pediatric dentists, pedodentists, oral/maxillofacial surgeons, and orthodontists wherein the duty cycle of procedures thus performed in these respective field when using multi component catalytic U.PW based compound or coupling gel, spray, or liquid or gas, or tooth paste for catalytic, scintillating, repeatable triggering, thus facilitating the shortening, and time and resources saving, as results of effectively reduction of the population of noxious species such as pluck formation on surface or volume, within predetermined area or dimension, on teeth, or between teeth, or gums, thus increasing the level of health, and therapeutic applications of devices according to the methodology of the present invention for preventative treatment as well as for damage limitation exercises, and for cleaning deep, and thoroughly the entire mouth.

98. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, comprising; utilization for dentistry, general dentists, periodentists, orthodontists, pedodentists, pediatric dentists, pedodentists, oral/maxillofacial surgeons, and orthodontists wherein catalytic tooth paste is been used containing scintillating elementals causing efficient conversion from Visible, NIR, IR to

UVA, UVB, UVC thus facilitating triggering, and re-triggering using light alone, in addition to using an optronic brush to apply said paste when 1st brushing teeth in the mornings, or cyclically, or non recurrently, cleaning the mouth continuously throughout the day using light.

99. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, comprising; utilization for dentistry, general dentists, periodentists, orthodontists, pedodentists, pediatric dentists, pedodentists, oral/maxillofacial surgeons, and orthodontists wherein the brush contain at least one optical fiber, diffuser, aerobic, and non aerobic guide, support means, and power supply on board for triggering the catalytic action of catalytic paste repeatedly.

100. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, comprising; utilization for dentistry, general dentists, periodentists, orthodontists, pedodentists, pediatric dentists, pedodentists, oral/maxillofacial surgeons, and orthodontists wherein the photo catalytic tooth paste is containing mint flavored or aromatic elements so as to esthetically fit behavioral pattern, and preferences of producers, end users, and doctors, effectively increasing the cleanliness of he mouth area.

101. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, comprising; utilization for dentistry, general dentists, periodentists, orthodontists, pedodentists, pediatric dentists, pedodentists, oral/maxillofacial surgeons, and orthodontists wherein the brush used to triggered the photo catalytic tooth paste contain a sub-miniaturized radiation unit having a relatively high intensity source of light from about 1mW Cm2, to about 180mW Cm2, and wherein light from the brush is reaching to exposed said tooth paste throughout the mouth, teeth, and gums, and wherein after 1st application of the paste, repeatable triggering may occur just by exposing the thin film layer left on the tooth over several hours, so by introducing light to the mouth after brushing has occurs the catalytic processes according to the present invention continue to occur bringing with them protection, and treatment benefits for the health of the mouth, and surrounding area.

102. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, comprising; utilization for dentistry, general dentists, periodentists, orthodontists, pedodentists, pediatric dentists, pedodentists, oral/maxillofacial surgeons, and orthodontists wherein the brush used to trigger the catalytic tooth paste is containing at least one LED, laser, flash lamp, quasi CW laser, hybrid, or integrated light source or guiding light from external light source in proximity or through the use of a photonic band-gap fiber, guide, or bundle of fibers.

103. Method for executing a photochemical treatment through a jet stream of light

transmitting liquid according to claim 1, comprising; utilization for dentistry, general dentists, periodentists, orthodontists, pedodentists, pediatric dentists, pedodentists, oral/maxillofacial surgeons, and orthodontists wherein only light is effectively treating the coated area after firsts application of the paste have occurred.

104. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, comprising; utilization for dentistry, general dentists, periodentists, orthodontists, pedodentists, pediatric dentists, pedodentists, oral/maxillofacial surgeons, and orthodontists wherein catalytic tooth paste according to the present invention is reducing the humic acids, bad smells, and improving decay condition by reducing the concentration of noxious species, bacteria, viruses, cysts which may threat a mouth healthy condition.

105. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, comprising; utilization for dentistry, general dentists, periodentists, orthodontists, pedodentists, pediatric dentists, pedodentists, oral/maxillofacial surgeons, and orthodontists wherein global solar radiation is used to triggered the photo catalysts at about the 1mW/Cm2, energy density, and wherein a scintillating elemental has been added, doped, spattered, vaporized, mixed to convert visible radiation to UVA, UVB, UVC from about 1eV, to about 9.1eV, and wherein condensing optics, and delivery interfaces guide the light into the mouth area, surface, or exact location to be remedied.

106. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, comprising; utilization for dentistry, general dentists, periodentists, orthodontists, pedodentists, pediatric dentists, pedodentists, oral/maxillofacial surgeons, and orthodontists wherein the catalytic scintillating tooth paste is stored, temporarily, or permanently in a tube, or capsule, conduit or chamber prior to application, delivery, or triggering, or re-triggering, cyclically, recurrently, or non recurrently for the elimination of pluck, and noxious bacteria, and bad smell effect and humic acids.

107. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, comprising; utilization for dentistry, general dentists, periodentists, orthodontists, pedodentists, pediatric dentists, pedodentists, oral/maxillofacial surgeons, and orthodontists wherein the catalytic scintillated compound according to TIO2 photo catalyst into homogenized distribution within the multi-component suspension or paste for triggering by the flowing liquid light guide.

108. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, comprising; utilization for dentistry, general dentists, periodentists, orthodontists, pedodentists, pediatric dentists, pedodentists,

oral/maxillofacial surgeons, and orthodontists wherein the catalytic scintillated compound according to the present invention is stored, temporarily, or permanently in a compressed form.

109. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, comprising; utilization for dentistry, general dentists, periodentists, orthodontists, pedodentists, pediatric dentists, pedodentists, oral/maxillofacial surgeons, and orthodontists wherein the catalytic scintillated compound according to the present invention is stored, temporarily, or permanently in form of a light spray.

110. Method according to claim 1, comprising utilization of devices using method of the present invention wherein the laser light source is selected from Gas discharge laser, diode pumped lasers, plasma discharged lasers, solid state lasers, semi conductor lasers, crystal type of lasers, X-rays pumped lasers, E-beam pumped gas lasers types, FEL (Free Electron Laser amplifier), EA/FEL (Electrostatically Accelerated Free Electron Laser), or organic laser types or any combination thereof.

111. Method for sterilizing and disinfecting the surface of medical instrumentation, the mouth, and blood, non invasively according to any of the preceding method claims, comprising geometrical utilization of devices using method of the present invention wherein the laser light source is selected from Gas discharge laser, diode pumped lasers, plasma discharged lasers, solid state lasers, semi conductor lasers, crystal type of lasers, X-rays pumped lasers, E-beam pumped gas lasers types, FEL (Free Electron Laser amplifier), EA/FEL (Electrostatically Accelerated Free Electron Laser), or organic laser types or any combination thereof.

112. A device using the method of the present invention according to claim 1, comprising a preferred mode especially beneficial for packaging materials having high refractive index selected from Polyolefine, polyamide, polycarbonate, polyesteramide, polyester resine combination thereof, or terephtalate (PET), Polybutylen terephtalate (PBT), polyalkyl terephtalate, polyethylen naphtalate (PEN), polyalkyl naphtalate (PETG) having adequate refractive index profile therein for guiding light throughout. Especially beneficial for disinfection through the packaging by UVA laser, operating in pulsed mode, beneficial for quality control applications in mass production lines of mineral waters, flavored waters, beverages, juices, liquids, gasses, food based products, and medical preparation including the production, and polishing of insulin based products.

113. A device using the method of the present invention for a real time flowing liquid waveguide according to claim one, wherein advanced oxidation and photo catalytic effects are achieved using the flowing liquid waveguide of the method of the present invention for detoxification and sterilization of surfaces from dangerous bacteria and

chemicals contaminating the surface either through normal application or by hostile action wherein the principle is combination of UV/VIS light with photo catalytic materials in the context of a real time flowing liquid waveguide of the present invention and wherein the chemicals such as oxidants, photo catalysts will be sprayed/scattered, inserted or added, subtracted or mixed or combination interact with the UVJET in the form of liquid solution or suspension stream or droplets or cloud of droplet from one or more species, and wherein the light pulses synchronized so that illumination reaches the active chemicals in the right place at the right time pretreatment of surfaces with non-volatile materials such as TiO2, ZnO etc is preferred mode of use of the various components of the invention wherein the inner walls or surfaces of water projection means is coated with photocatalyt6ic thin layer or film to ensure biocompatibility upon interaction with light according to the method of the present invention.

114. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, wherein at least one oxidizer or at least one photocatalyst material or particle or combination is added, immobilized or mixed with the jet stream at the target site, or to the water projection means, or added to said jet stream perpendicularly or externally or internally or in combination thereof for purpose of initiating advanced oxidation, or photocatalysis or combination for treatment and decontamination of a predetermined volume of liquids and gases, or over predetermined surface area, over a predetermined period of time prior, during, after or combination wherein UV light is launched into said jet stream.

115. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 114, wherein the oxidizer or the photocatalyst materials are selected from TiO2, ZnO, ITO, H2O2, and wherein their relative proportionate concentrations are calibrated against specific calibration standards for oxidation, reduction, advanced oxidation and mineralization of contaminants according to the method of the present invention.

116. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, wherein; the target site is human skin being decontaminated, washed and disinfected and wherein photolysis, sterilization, disinfection and photocatalysis are being initiated to neutralize and reduce, oxidize and mineralize simultaneously noxious NBC BW (Biological warefare agents), or CW (chemical warefare agents) or any combination thereof.

117. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, wherein; the target site is agrofood products or packaging or combination such as a bottle or jug.

118. Method for executing a photochemical treatment through a jet stream of light

transmitting liquid according to claim 1, wherein the water projection means forming flowing liquid waveguide is an aseptic filler for the food and beverage industry.

119. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, wherein the light transmitting liquid contain at least one optical marker for monitoring the rate or characteristics of photochemical effects such for photolysis, advanced oxidation, or photocatalysis or any combination thereof.

120. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, wherein; the target site is selcted from vhiecles, infrastructure suport means, the space between infrastructure support means, the space underneath a droped cieling, or the space beneath a raized floor or any combination thereof.

121. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, wherein the target site is a melignent tumor being dissolved, oxidized, or photolyzed, and wherein the light transmitting liquid is UPW (Ultra Pure Water) ensuring precision processing due to enhanced optical properties and biocompatibility of procedure.

122. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, wherein; the target site is pluck formation in an aorta, vein or blood vessel and wherein said pluck formation is being oxidized, photolyzed, or being mineralized, or photochemically opened or smoothed, or unclogged, reduced or combination treatment.

123. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, wherein the target site is the root channels of teeth, or pluck formation around teeth.

124. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, wherein; the target site is access restenosis, or unwanted tissues.

125. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, wherein multi-photon absorption processes occur within the liquid jet.

126. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, wherein the photochemical processes initiated within the liquid jet include disinfection, sterilization, advanced oxidation, photolysis, photocatalysis, photo-electro-catalysis, phenton, phenton processes, mineralization, reduction, oxidation or any combination thereof.

127. Method for executing a photochemical treatment through a jet stream of light transmitting liquid according to claim 1, wherein; the water projection means, the jet stream, the target site or any combination thereof is dielectric material, semi conductive material, super conductive material or any combination thereof, useful to maximize vibrational excitation stages reducing the fluence rate or energy level of the delivered or guided light to achieve a predetermined reaction rate or specific oxidation path photo-electro-chemically.

Dr. MEIR NOAM
ADVOCATE & PATENT ATTORNEY
P.O.B. 34335, Jerusalem
TEL. (972) 2-6518880

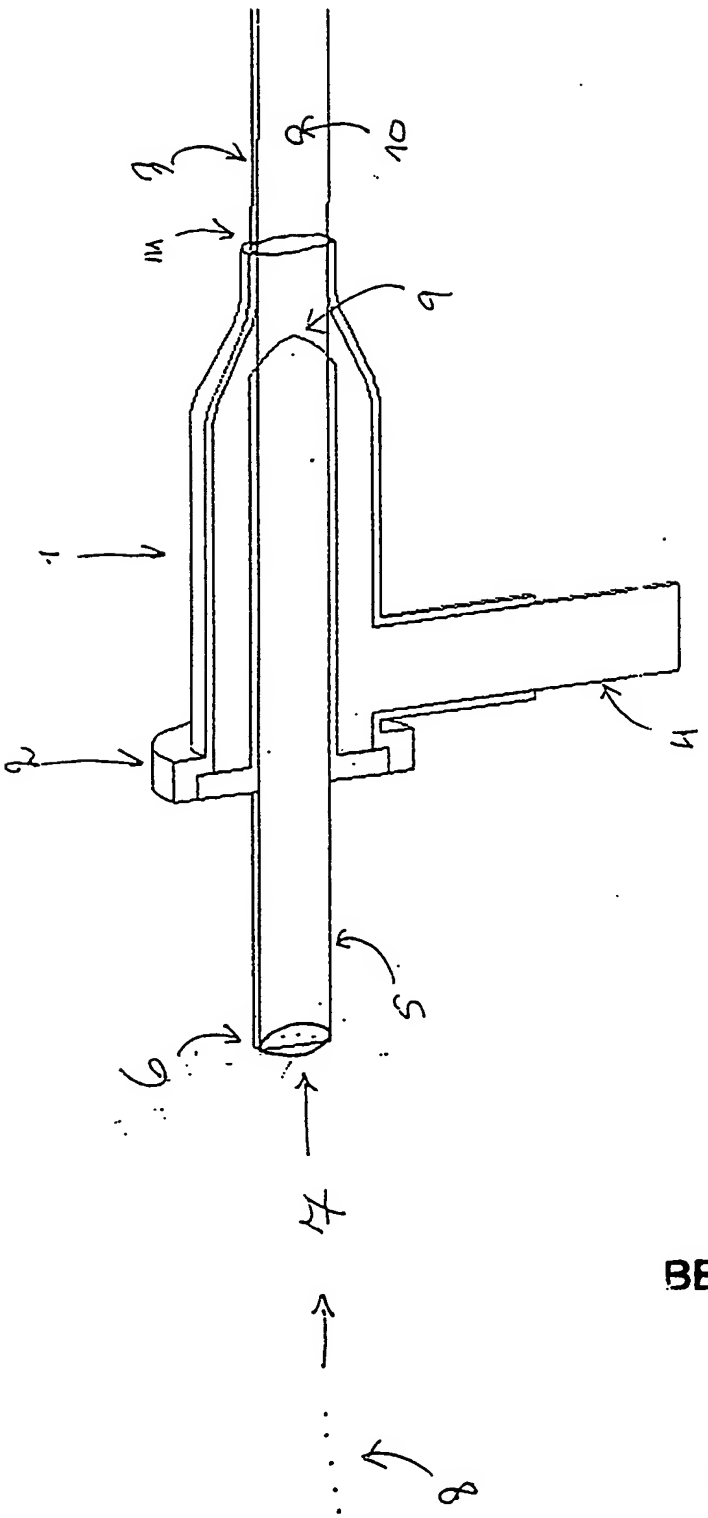

Fig. 1

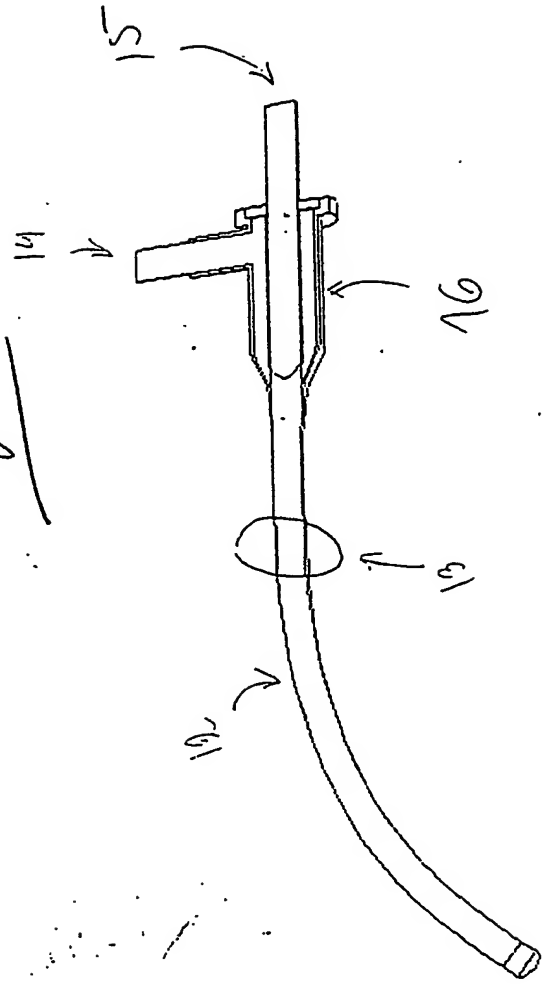

Fig. 2

Fig. 3

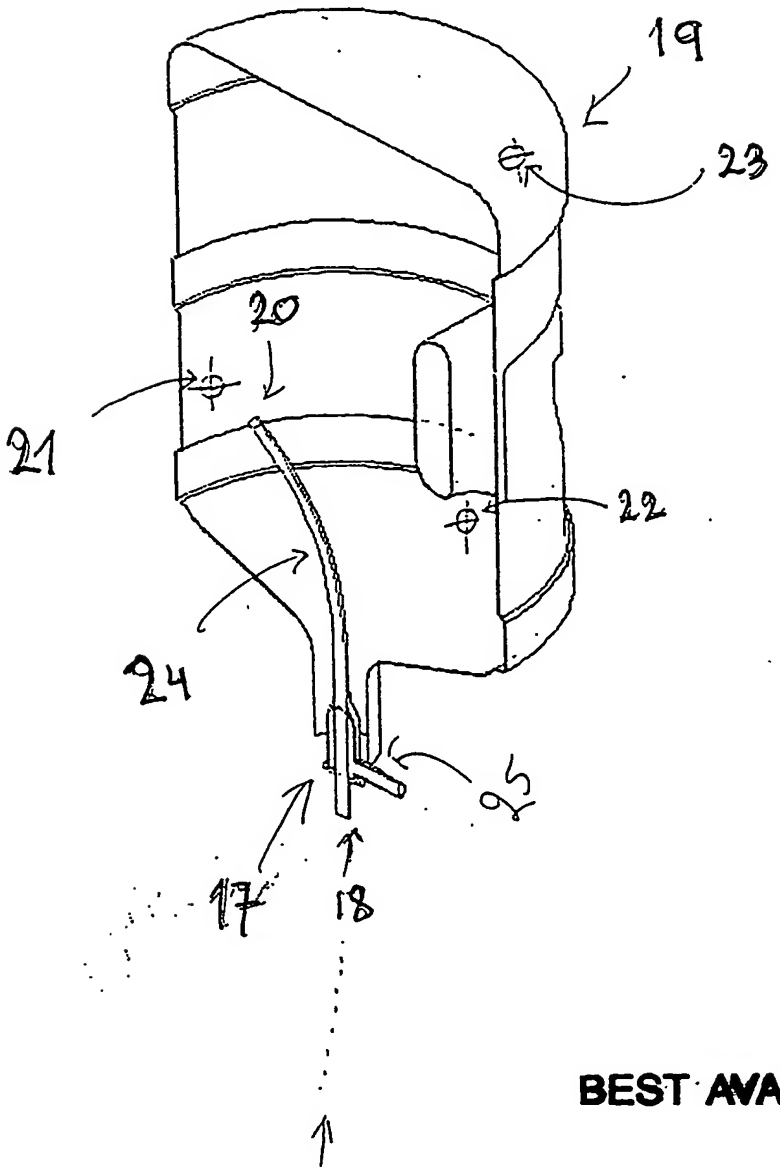

Fig. 4

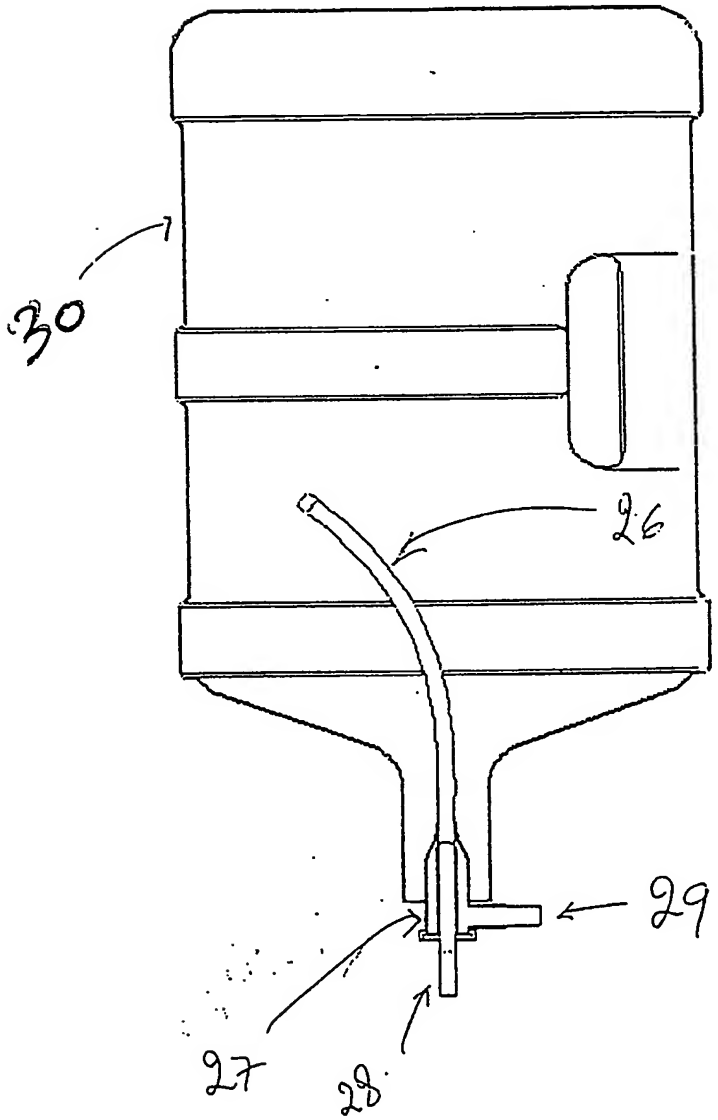

Fig. 5

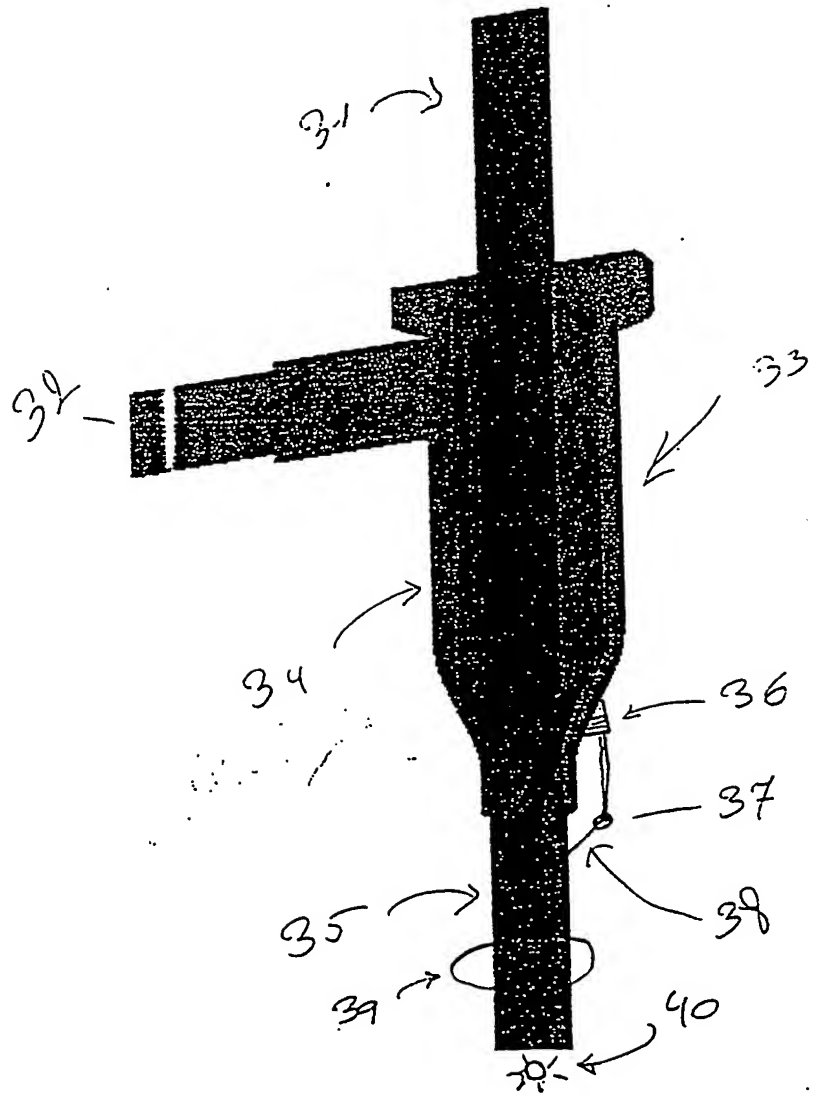

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Fig. 6

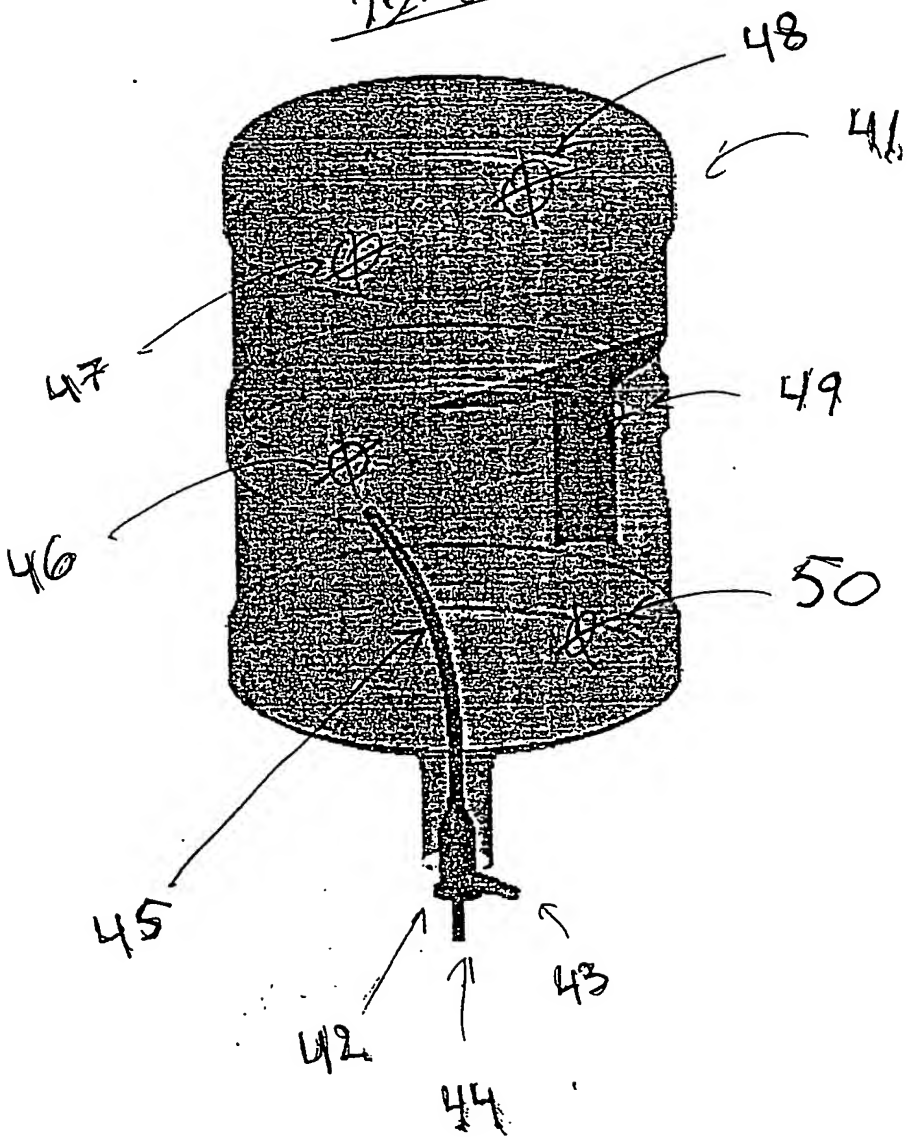

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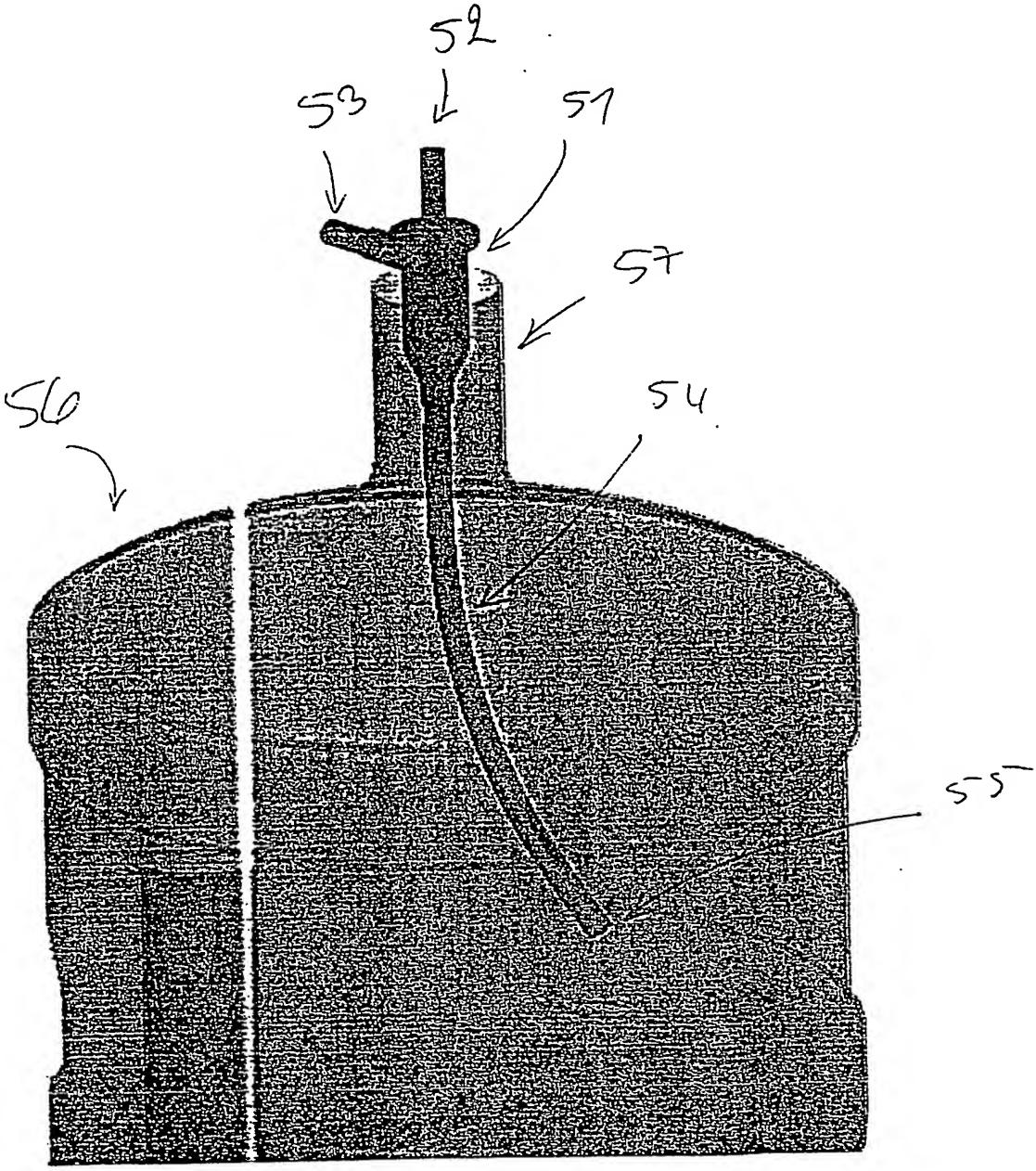
Fig. 4



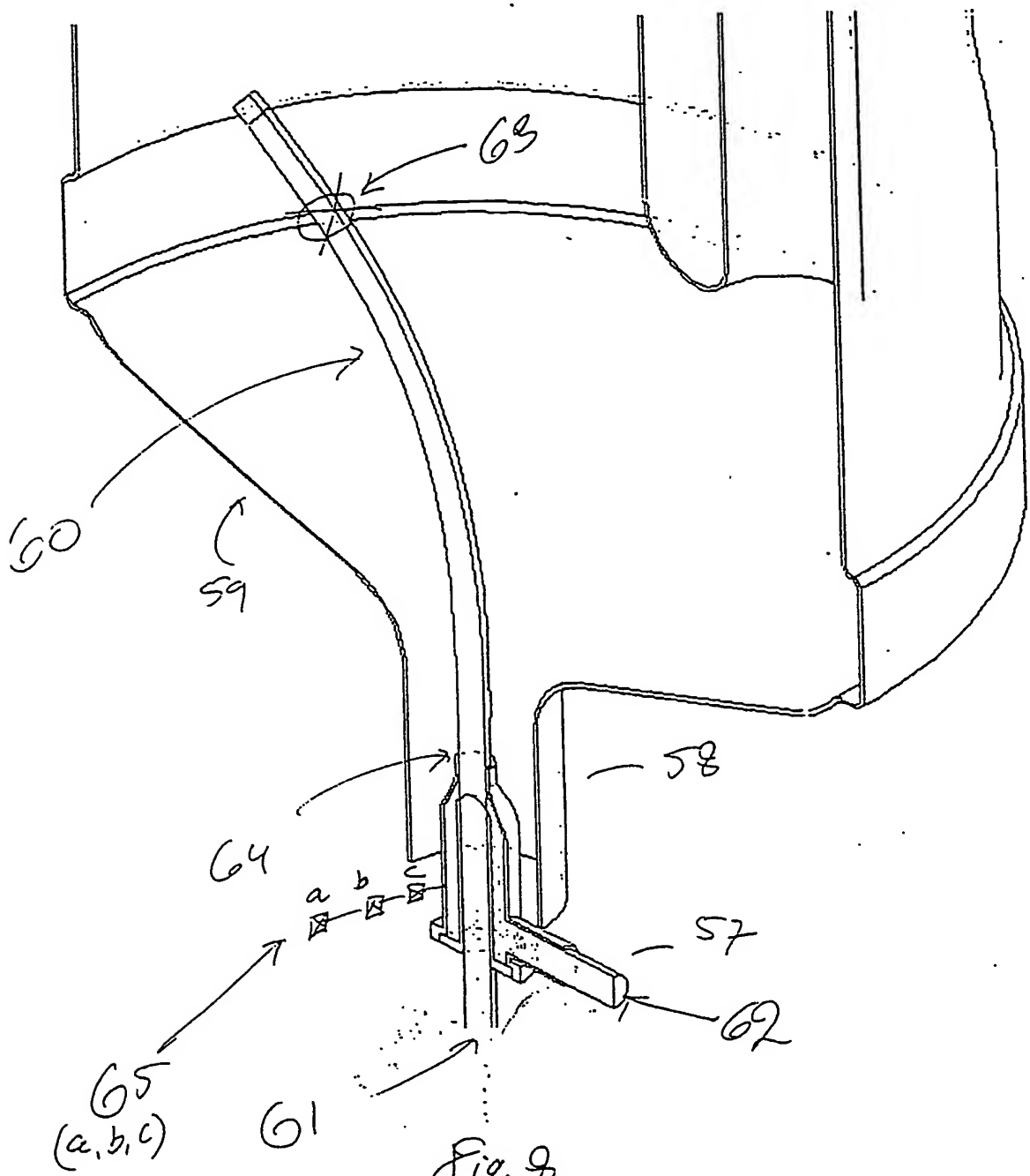


Fig. 8

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figure 9A

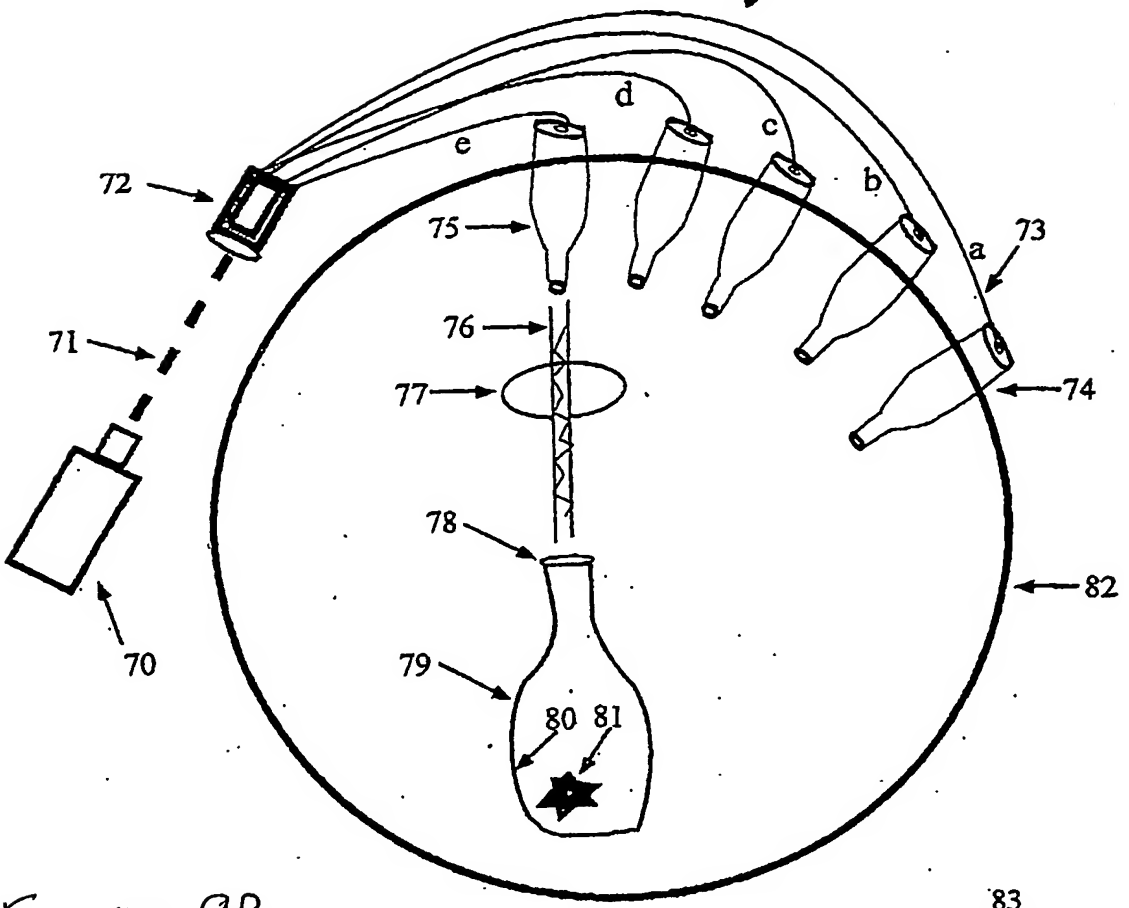
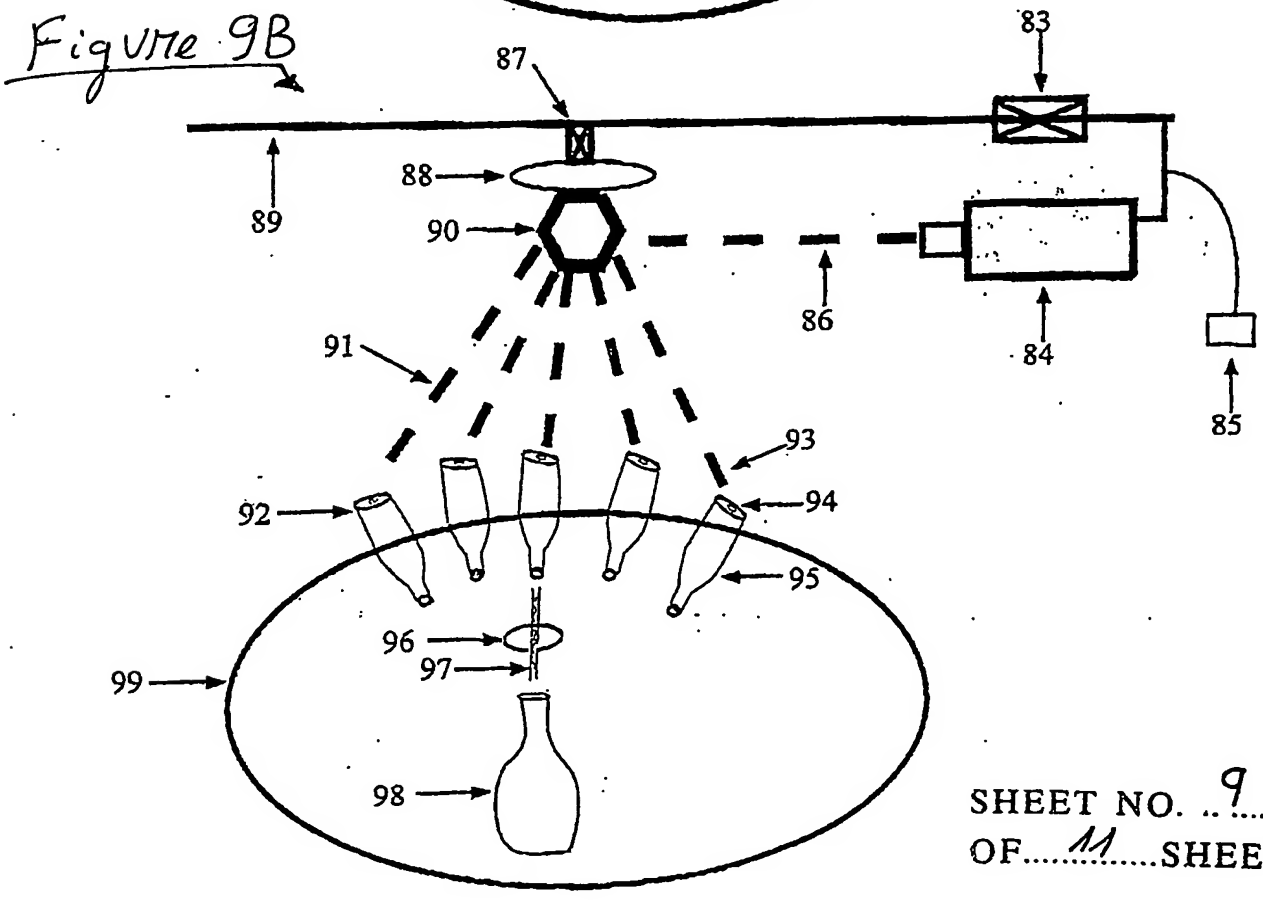


Figure 9B



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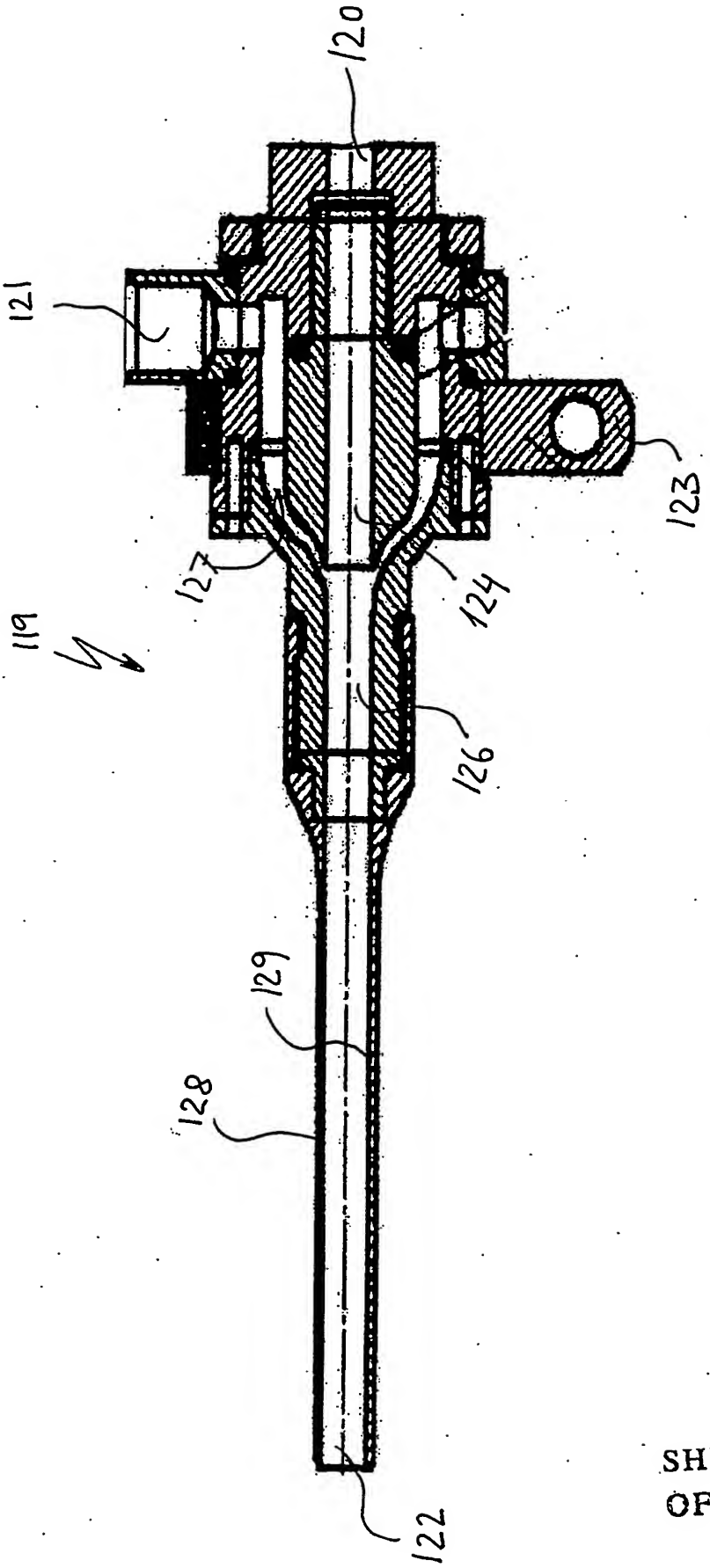

Figure 10

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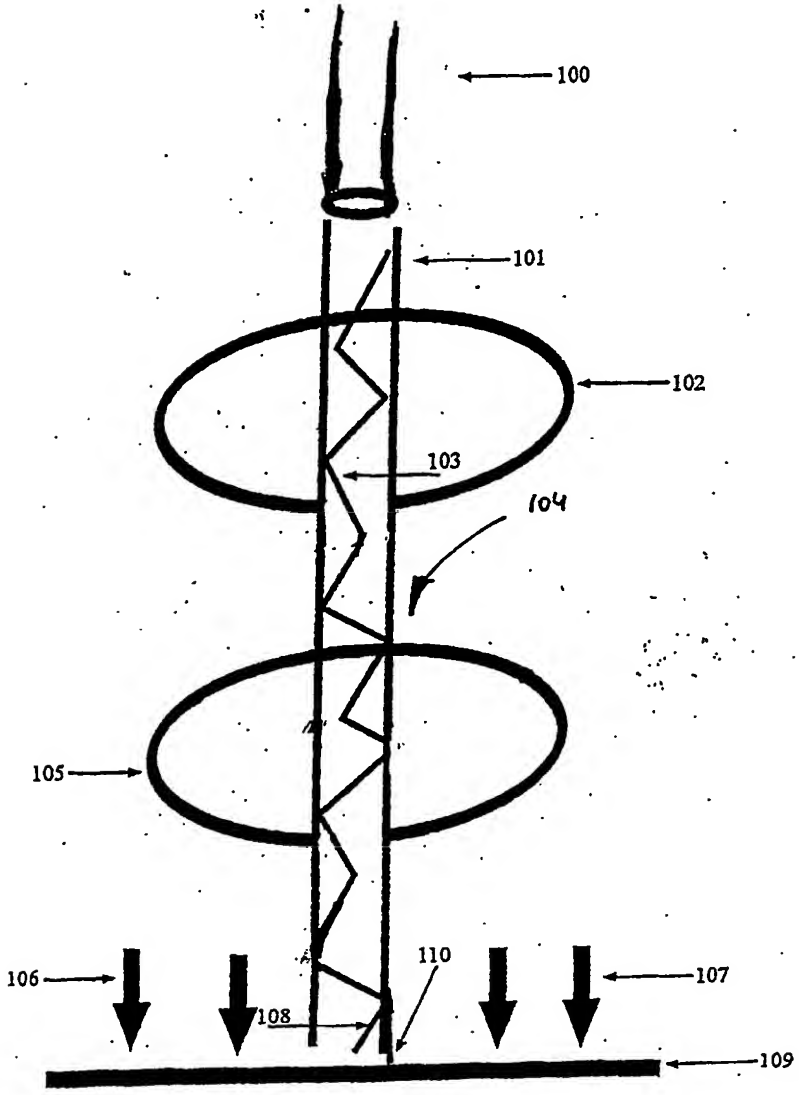
Figure 11



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